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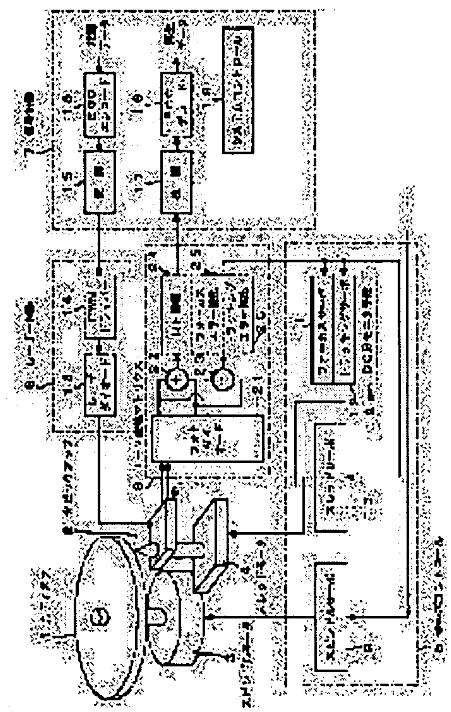
(54) OPTICAL DISK RECORDING AND REPRODUCING DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To provide an optical disk recording and reproducing device which can perform stable pause operation even if DC offset is included.
SOLUTION: This optical disk recording and reproducing device moves an optical pickup on an optical disk 1, positions an optical pickup 2 to an object track position by a tracking servo circuit 12, irradiates the optical disk 1 with a light beam by an optical system of the optical pickup 2, and records or reproduces a recording mark. Further, when the optical pickup 2 is moved in the track direction of the optical disk 1 or the direction of the sector, an offset component is detected by a DC monitor means 12a from a tracking error signal of the tracking servo circuit 12, and pause operation is started at a position at which an offset component is made the minimum in the prescribed section.



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TITLE: OPTICAL DISK RECORDING AND REPRODUCING DEVICE

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NAME	COUNTRY
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section.

DERWENT-ACC-NO: 1999-116356

DERWENT-WEEK: 199910

TITLE: Optical disk recording and reproducing apparatus e.g. for CD-ROM, CD-R - has tracking servo circuit which outputs tracking error signal, when DC monitor unit detects offset component, while moving optical pick-up in direction of track or of optical disk

PATENT-ASSIGNEE: SONY CORP[SONY]

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ABSTRACTED-PUB-NO: JP 10340460A

BASIC-ABSTRACT:

NOVELTY - A tracking servo circuit (12) outputs a tracking error signal when an offset component is detected by a DC monitor unit (12a) when optical pick-up (2) is moved in direction of track of an optical disk (1). When offset component is detected, a pause operation is started and the pick-up skips the track by the position which is minimum in predetermined area.

USE - For recording and reproducing information to and from CD-ROM, CD-R.

ADVANTAGE - Track jump or pause operation is stabilized even if DC offset exists. DESCRIPTION OF DRAWING(S) - The figure shows block diagram of optical

disk recording and reproducing apparatus. (1) Optical disk; (2) Optical pick-up; (12) Tracking servo circuit; (12a) DC monitor unit.

CHOSEN-DRAWING: Dwg.1/6

TITLE-TERMS: OPTICAL DISC RECORD REPRODUCE APPARATUS CD ROM CD TRACK SERVO
CIRCUIT OUTPUT TRACK ERROR SIGNAL DC MONITOR UNIT DETECT OFFSET
COMPONENT MOVE OPTICAL PICK UP DIRECTION TRACK OPTICAL DISC

DERWENT-CLASS: T03 W04

EPI-CODES: T03-B02A; W04-C03;

SECONDARY-ACC-NO:
Non-CPI Secondary Accession Numbers: N1999-085945

CLAIMS

[Claim(s)]
[Claim 1] Move an optical pickup on a record medium and the above-mentioned optical pickup is positioned in the purpose truck location with a tracking means. In an optical disk record regenerative apparatus which a light beam is made to glare on the above-mentioned record medium according to optical system of the above-mentioned optical pickup, and records or reproduces a record mark In case the above-mentioned optical pickup is moved in the direction of a truck or the direction of a sector of the above-mentioned record medium, an offset component is detected from a tracking error signal of the above-mentioned tracking means. An optical disk record regenerative apparatus characterized by making it move in a location in which the above-mentioned offset component serves as min in the predetermined section.
[Claim 2] It is the optical disk record regenerative apparatus characterized by carrying out migration of the above-mentioned optical pickup as [be / it / a track jump] in an optical disk record regenerative apparatus given in the 1st term of a claim.
[Claim 3] It is the optical disk record regenerative apparatus characterized by carrying out migration of the above-mentioned optical pickup as [be / it / one track jump by the side of inner circumference of the above-mentioned record medium] in an optical disk record regenerative apparatus given in the 1st term of a claim.
[Claim 4] The predetermined section which detects min of the above-mentioned offset component in an optical disk record regenerative apparatus given in the 1st term of a claim is an optical disk record regenerative apparatus characterized by carrying out as [be / it / the section for one rotation of the above-mentioned optical disk].
[Claim 5] The predetermined section which detects min of the above-mentioned offset component in an optical disk record regenerative apparatus given in the 1st term of a claim is an optical disk record regenerative apparatus characterized by carrying out as [be / they / several frames of a regenerative signal of the above-mentioned optical disk].

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] This invention relates to the pause actuation at the time of using a light beam for the compact disc (CD-ROM) or recordable compact disk (CD-R) only for [an optical disk] playbacks, and recording or reproducing data.
[0002]
[Description of the Prior Art] By progress of the multimedia which points to a highly informative society, much more high-performance-izing of an optical disk and large capacity-ization are called for. This optical disk can be divided roughly into two kinds, the mold optical disk only for playbacks of only reproducing the information data recorded at the time of disk cutting from that function and the purpose of use, and the write once optical disk whose rewriting can record only at once and is impossible.
[0003] In such an optical disk, it sets by requiring large capacity-ization at the time of disk cutting or a postscript. Only by the groove record method which records information data only on the groove section which consists of a slot spirally prepared on the record optical disk side Since the storage capacity demanded was not able to be satisfied, the land groove record method which records information data also on the portion called the land between the groove section and the groove section was adopted.
[0004] That is, in order to record information data on the predetermined truck on an optical disk, an optical pickup must be moved to up to the aim truck of an optical disk, and a laser beam must be made to glare on an aim truck in an optical disk record regenerative apparatus. For that, it is necessary to position an optical pickup to a target position. There is tracking servo system as servo system which moves an optical pickup to the location of the radial aim of an optical disk.
[0005] Tracking servo system consists of a tracking coil of the actuator systems in an optical pickup, and a tracking servo circuit. An actuator system carries out tracking actuation of the optical pickup minutely for example, with a biaxial actuator.
[0006] And if a laser beam pursues and carries out the tracking of the truck, reads the address and gets to know difference with the aim address, only the part will carry out minute seeking. Since it is difficult for stability to carry out seeking control when an eccentric speed is large at this time, it waits until an eccentric speed becomes small, and finally it reaches to an aim truck, and actuation of record is performed by the land groove record method which records information data on the land between the groove section on an optical disk, and the groove section.
[0007] The tracking by the push pull method used for the conventional land groove record method at drawing 4 is shown. The tracking by the conventional push pull method is explained using drawing 4 . In the land groove record method which records information data also on the portion called the lands L1, L2, and L3 between the groove sections G1 and G2, G3, and the groove sections G1 and G2 and G3 in drawing 4 A In order for the adjoining groove sections G1 and G2, G3, and the lands L1, L2, and L3 to record information data, it is necessary to perform tracking to each groove sections G1 and G2, G3, and lands L1, L2, and L3.
[0008] The push pull method is a method of detecting a tracking error, by taking out the light which carried out reflection diffraction by the groove sections G1 and G2 on the record thin film on an optical disk, and G3 as an output difference in respect of [where 2 ****s was taken on the photodiode] light-receiving. As shown in drawing 4 A, namely, a laser spot, the groove sections G1 and G2, the center of G3, Or when the center of the groove sections G1 and G2 called a laser spot and lands L1, L2, and L3, G3 and the groove sections G1 and G2, and the pars intermedia of G3 is in agreement After it carried out tracking and the truck has been in agreement, in drawing 4 B, the tracking error signal 101 as symmetrical reflection diffraction light distribution is acquired. In other than this, since tracking has not been carried out, it is in the condition from which the truck shifted, and they serve as a serpentine curve as reflection diffraction light distribution from which the amplitude from which optical

reinforcement shifted in right and left differs. Thus, as the tracking error signal 101 is set to "0", tracking can be carried out to the groove sections G1 and G2, the center of G3, or the center of lands L1, L2, and L3.

[0009] Here, as shown in drawing 5 , offset might arise also with the inclination (radial tilt) of the radial direction of an optical disk 100. In drawing 5 , since it is the imbalance of optical reinforcement in order that the beam spot of the reflected light of an optical disk 100 may move only fand2deltatheta to the focal distance f of an objective lens 102 on a photodiode 103 when only deltatheta has an inclination in an optical disk 100 to the field which intersects perpendicularly with the optical axis of a laser beam, a push pull signal will offset.

[0010] Therefore, since light and darkness appear on a photodiode 103 when there is the beam spot in the center of a photodiode 103, and the beam spot crosses the truck of an optical disk 100, and the zero crossing point of the tracking error signal 101 takes the truck lead, tracking can be performed using this tracking error signal 101. However, when the beam spot shifts from the center of a photodiode 103 and moves (at i.e., when [the time of an objective lens 102 driving to a radial direction by tracking actuation, and when a radial tilt is in an optical disk 100]), in order that the optical intensity distribution of the beam spot may move on a photodiode 103, a racking error signal turns into a signal which has a part for DC offset used as a wave with a late period. Tracking cannot be performed using the tracking error signal which has such offset.

[0011] For example, when spindle servo system will be in a lock condition, the halt equipment of the disk regenerative apparatus which has the timing modification circuit which changes a track jump is indicated by JP,4-132056,A. In performing pause actuation, it reads, whenever an optical disk rotates one time, and he carries out 1 track jump of the point in the direction of inner circumference (the read-out direction and hard flow), and is trying to repeat this 1 track-jump actuation in the optical disk currently recorded by the constant linear velocity (CLV) in this disk regenerative apparatus. The wave form chart of one track jump when performing the conventional pause actuation to drawing 6 is shown. As shown in drawing 6 , 1 track-jump wave 105 shown by the tracking error signal TE becomes the wave which has a part for the DC offset 106 at the period of the disk 1 rotation 104, and the amount of [107] DC offset appears similarly at the period of the disk 1 following rotation.

[0012]

[Problem(s) to be Solved by the Invention] Thus, since pause actuation by one track jump was performed without regarding a part for this DC offset at all although the amount of [by the optical intensity distribution of the beam spot moving on a photodiode 103] DC offset appeared when a radial tilt was in an optical disk 100, there was un-arranging [that the pause actuation by one track jump became unstable] in 1 track-jump wave when performing the conventional pause actuation.

[0013] This invention is made in view of this point, and aims at offer of the optical disk record regenerative apparatus which can perform pause actuation stabilized even if the amount of DC offset was.

[0014]

[Means for Solving the Problem] An optical disk record regenerative apparatus of this invention moves an optical pickup on a record medium. In an optical disk record regenerative apparatus which position the above-mentioned optical pickup in the purpose truck location with a tracking means, and a light beam is made to glare on the above-mentioned record medium according to optical system of the above-mentioned optical pickup, and records or reproduces a record mark In case the above-mentioned optical pickup is moved in the direction of a truck or the direction of a sector of the above-mentioned record medium, an offset component is detected from a tracking error signal of the above-mentioned tracking means, and it is made to move in a location in which the above-mentioned offset component serves as min in the predetermined section.

[0015] According to the optical disk record regenerative apparatus of this invention, the following operations are carried out. This optical disk record regenerative apparatus moves an optical pickup on a record medium, positions the above-mentioned optical pickup in the purpose truck location with a tracking means, makes a light beam glare on the above-mentioned record medium according to optical system of the above-mentioned optical pickup, and records or reproduces a record mark. Moreover, this optical disk record regenerative apparatus detects an offset component from a tracking error signal of the above-mentioned tracking means. And this optical disk record regenerative apparatus moves the above-mentioned optical pickup in the direction of a truck or the direction of a sector of the above-mentioned record medium in a location in which the above-mentioned offset component serves as min in the predetermined section.

[0016]

[Embodiment of the Invention] Below, the gestalt of this operation is explained. The optical disk which applies the gestalt of this operation is a compact disc (CD). There are some families in CD and there are CD-ROM only for playbacks and a CD-R which can be written in only once. The gestalt of this operation is applied to this CD family.

[0017] Next, the configuration of the gestalt of this operation applied to such an optical disk is shown. Drawing 1

is the block diagram showing the configuration of the optical disk record regenerative apparatus of the gestalt of this operation. First, the configuration of an optical disk record regenerative apparatus is explained. The optical disk record regenerative apparatus of this example has the servo control circuit 5 which controls an optical disk rotation drive control system, a coarse adjustment delivery drive control system, and each servo system of an optical pickup control system, the laser control circuit 6 which controls the laser power supplied to an optical pickup 2, the I-V transformation-matrix circuit 8 which acquires a playback RF signal, a focal error signal, and a tracking error signal from the reflected light of laser, and the signal-control circuit 7.

[0018] An optical disk rotation drive control system has the spindle servo circuit 9, a spindle motor 3, and an optical disk 1. Here, an optical disk 1 constitutes a record medium. A coarse adjustment delivery drive control system has the thread servo circuit 10 and the thread motor 4. An optical pickup control system has an optical pickup 2, the I-V transformation-matrix circuit 8, the focus servo circuit 11, the tracking servo circuit 12, and the laser control circuit 6. The photodiode 21 with which the I-V transformation-matrix circuit 8 detects the reflected light of laser by two parting planes here, The adder 22 adding 2 division signals, and the subtractor 23 which subtracts 2 division signals, The RF amplifying circuit 24 which supplies a servo signal to the thread servo circuit 10 while amplifying a playback RF signal from the output of an adder 22, It has the focal error detection circuit 25 which detects a focal error signal from the output of a subtractor 23, and the tracking error detector 26 which detects a tracking error signal from the output of a subtractor 23. Moreover, the laser control circuit 6 has the PWM driver 14 who carries out Pulse Density Modulation of the laser light, and the laser diode 13 which emits light in laser light.

[0019] A signal-control circuit 7 has the system-control circuit 19 which controls each part of equipment, the ECC encoding circuit 16 which adds an error correction code to record data with the Lead Solomon product code, the modulation circuit 15 which carries out eight-to-fourteen modulation of the record data with which the error correction code was added, the demodulator circuit 17 which supply a servo signal to a spindle servo circuit 9 while carrying out the EFM recovery of the playback data, and the ECC decoding circuit 18 which carry out error correction processing with the Lead Solomon product code, and output playback data to playback data.

[0020] Here, a monitor is carried out by the period of an optical disk's 1 1 rotation of a part for DC offset by the optical intensity distribution of the beam spot by the radial tilt of an optical disk 1 moving to the tracking servo circuit 12 on a photodiode 21, and it consists of especially this example so that it may have DC monitor means 12a which searches the time amount which carries out pause actuation by one track jump to stability.

[0021] Next, the connection relation of an optical disk record regenerative apparatus is shown. First, the connection relation of an optical disk rotation drive control system is shown. The spindle servo circuit 9 is connected with a spindle motor 3, and a spindle motor 3 is connected with an optical disk 1 through a rolling mechanism.

[0022] Next, the connection relation of a coarse adjustment delivery drive control system is shown. The thread servo circuit 10 is connected with the thread motor 4, and the thread motor 4 is connected with the optical pickup 2 of an optical pickup control system through a rough delivery device.

[0023] Next, the connection relation of an optical pickup control system is shown. An optical pickup 2 is connected with the photodiode 21 of the I-V transformation-matrix circuit 8, two split outputs of a photodiode 21 are connected with a subtractor 23 while connecting with an adder 22, and an adder 22 and a subtractor 23 are connected with the focal error detection circuit 25 and the tracking error detector 26 while connecting with the RF amplifying circuit 24.

[0024] Moreover, the focal error detection circuit 25 and the tracking error detector 26 are connected with the focus servo circuit 11 and the tracking servo circuit 12, and the focus servo circuit 11 and the tracking servo circuit 12 are connected to the focal coil and tracking coil which an optical pickup 2 does not illustrate.

[0025] Next, the connection relation of a signal-processing system is shown. The RF amplifying circuit 24 is connected with the demodulator circuit 17 of the signal-control circuit 7, and a demodulator circuit 17 is connected with the ECC decoding circuit 18. Moreover, the ECC encoding circuit 16 is connected with a modulation circuit 15, a modulation circuit 15 is connected with the PWM driver 14 of the laser control circuit 6, and the PWM driver 14 is connected with laser diode 13, and laser diode 13 is formed so that a predetermined laser beam may be formed in an optical pickup 2.

[0026] Moreover, the optical disk record regenerative apparatus is connected with the host computer through the system controller 19 and the interface circuitry which is not illustrated.

[0027] Thus, outline actuation of the constituted optical disk record regenerative apparatus is explained. when the instruction from the host computer which is not a drawing example performs record or playback of an information signal to an optical disk record regenerative apparatus, after making seek operation the aim truck location on an optical disk 1 by the thread motor 4 and positioning an optical pickup 2 in it from a host computer, make a tracking coil and a focal coil drive by the tracking servo circuit 12 and the focus servo circuit 11, tracking and a focus are

made to tune finely, and it doubles with desired value.

[0028] While eliminating the information on the portion which makes leather power erasion power level beforehand by the laser control circuit 6, and is not recorded in the case of record, the information signal which adjusted leather power to light power level, recorded the information signal on the aim truck location, adjusted leather power to lead power level by the laser control circuit 6 on the occasion of playback, and was recorded on the aim truck location is reproduced.

[0029] By the signal-control system, the system-control circuit 19 supplies the command of a rotation instruction to the spindle servo circuit 9 of the servo control circuit 5 first based on a host computer. The spindle servo circuit 9 supplies a drive signal to a spindle motor 3 with this command, and rotates a spindle motor 3. The servo signal by which synchronous detection was carried out from the demodulator circuit 17 based on the playback RF signal is supplied to the spindle servo circuit 9.

[0030] Next, based on a host computer, the system-control circuit 19 supplies the command of a rough delivery instruction to the thread servo circuit 10. An optical pickup 2 reads the information signal of a current location in an optical disk 1, and supplies a RF signal, an addition signal, and a subtraction signal to the RF amplifying circuit 24, the focal error detection circuit 25, and the tracking error detector 26 through a photodiode 21, an adder 22, and a subtractor 23. The tracking error detector 26 generates a tracking error signal from a difference signal, and supplies it to the thread servo circuit 10. The thread servo circuit 10 generates a drive signal based on a tracking error signal, and supplies a drive signal to the thread motor 4. The thread motor 4 carries out rough seek operation of the optical pickup 2 through the rough delivery device which is not illustrated based on a drive signal.

[0031] Actuation of seeking servo system consists of two, thread motor 4 system and the actuator system in an optical pickup 2. Thread motor 4 system carries out rough seek operation of the optical pickup 2 by the thread motor 4, and positions by detecting a location with the encoder which is not illustrated. An actuator system carries out minute seek operation of the optical pickup 2 with the biaxial actuator using the tracking coil which is not illustrated.

[0032] Such an operating sequence of seeking servo system is explained below. First, rough seek operation is carried out to near the target truck location. Rough seeking is carried out, and even if an optical pickup 2 stops near the aim address, it does not immediately stop, but it vibrates, and the moving part of the actuator in an optical pickup 2 waits for the predetermined settling time, and stops.

[0033] Next, in order to read the address information which reached, truck drawing-in actuation is carried out. Here, when truck eccentricity speed is large, activation of truck drawing-in actuation is drawn, and it waits for this actuation until it is that of a lifting or a cone and an eccentric speed becomes near the zero about an error.

[0034] And if a laser beam pursues a truck, makes a tracking coil drive with the drive signal from the tracking servo circuit 12, carries out tracking by on-truck, reads the address and gets to know difference with the aim address, only the part will carry out minute seeking. At this time, an optical pickup 2 reads the information signal of a current location in an optical disk 1, and supplies it to the tracking error detector 26.

[0035] That is, a photodiode 21 receives the laser beam reflected with the optical disk 2 on 2 parting planes. A photodiode 21 changes into an electrical signal 2 division laser beam which received light, and supplies it to a subtractor 23. A subtractor 23 subtracts 2 division signals and generates a difference signal. The tracking error detector 26 detects a tracking error signal from a difference signal, and supplies it to the tracking servo circuit 12. The tracking servo circuit 12 performs the tracking of an optical pickup 2 with the tracking coil of the biaxial actuator which is not illustrated based on a tracking error signal. Moreover, the focal error detection circuit 25 detects a focal error signal from an information signal, and supplies it to the focus servo circuit 11. The focus servo circuit 11 performs focusing of an optical pickup 2 with the focal coil of the biaxial actuator which is not illustrated based on a focal error signal.

[0036] Since it is difficult for stability also at this time to carry out seeking control when an eccentric speed is large, it waits until an eccentric speed becomes small, and finally it reaches to an aim truck, and actuation of record or playback is performed.

[0037] After positioning an optical pickup 2 in an aim truck location, actuation of record or playback is performed as follows. At the time of playback, the system-control circuit 19 supplies a playback command to the PWM driver 14 of the laser control circuit 6. The PWM driver 14 adjusts laser luminescence power to playback power level, and supplies it to laser diode 13. Laser diode 13 irradiates laser light through a lens at an optical disk 1. A photodiode 21 receives the laser beam reflected with the optical disk 1 on 2 parting planes. A photodiode 21 changes into an electrical signal 2 division laser beam which received light, and supplies it to an adder 22. An adder 22 adds 2 division signals and generates a playback RF signal.

[0038] A playback RF signal is supplied to the RF amplifying circuit 24. The RF amplifying circuit 24 carries out RF amplification of the playback data, and supplies it to a demodulator circuit 17. A demodulator circuit 17 carries

out the EFM recovery of the playback data. A demodulator circuit 17 supplies the playback data to which it restored to the ECC decoding circuit 18. The ECC decoding circuit 18 carries out error correction processing with the Lead Solomon product code, and outputs playback data to playback data. The decoded information signal is supplied to a host computer.

[0039] At the time of record, the system-control circuit 19 supplies a record command to the PWM driver 14 of the laser control circuit 6. The record data supplied from the host computer is supplied to the ECC encoding circuit 16. The ECC encoding circuit 16 adds an error correction sign to record data with the Lead Solomon product code. The ECC encoding circuit 16 supplies the record data with which the error correction sign was added to a modulation circuit 15. A modulation circuit 15 carries out eight-to-fourteen modulation of the record data with which the error correction code was added. A modulation circuit 15 supplies the modulated record data to the PWM driver 14 of the laser control circuit 6. The PWM driver 14 does Pulse Density Modulation of the record data by which eight-to-fourteen modulation was carried out based on the record command, and supplies the laser flashing caution signal of light power level to laser diode 13. Laser diode 13 irradiates a laser beam through a lens at an optical disk 1. After the record thin film of an optical disk 1 was heated and has made it amorphous by the laser beam, record data is recorded on an aim truck location.

[0040] By DC monitor means 12a of the tracking servo circuit 12, a monitor is carried out by the period of an optical disk's 1 1 rotation of a part for DC offset by the optical intensity distribution of the beam spot by the radial tilt of an optical disk 1 moving on a photodiode 21, the amount of this DC offset searches the minimum time amount, and especially the gestalt of this operation here is made to carry out pause actuation by one track jump to stability by this time amount.

[0041] First, the sequence of 1 track-jump actuation of such track jump servo system of minute seeking is explained below. First, minute seek operation is carried out to near the location by the side of 1 truck inner circumference made into an aim. One track jump of minute seeking is actuation to which a light beam is moved by one truck by adding pulse current to the moving part of the actuator in an optical pickup 2, suspending an optical pickup 2 to the aim address.

[0042] That is, if a laser beam pursues a truck, makes a tracking coil drive with the drive signal from the tracking servo circuit 11, carries out tracking by on-truck, reads the address and gets to know the difference for one truck with the aim address, only the difference for the one truck will carry out minute seeking. At this time, an optical pickup 2 reads the information signal of a current location in an optical disk 1, and supplies it to the tracking error detector 26.

[0043] Hereafter, actuation of DC part monitor in such pause actuation is explained. The flow chart is shown in the wave form chart of DC part monitor for several frames of pause actuation of the gestalt of this operation to drawing 2 , and drawing 3 . As shown in drawing 3 , there is a pause demand from a host side at step S1 at n frames (here, n is the natural number and is the frame number of the image data of record or a regenerative signal.). Specifically in drawing 1 , the command of a pause demand is supplied to the system-control circuit 19 of the signal-control circuit 7 in n frames from a host computer. At step S2, a part for DC of the tracking error signal TE in n frames is measured. In drawing 1 , to DC part monitor means 12a of the tracking servo circuit 12 of the servo control circuit 5, specifically, the system-control circuit 19 supplies a control signal so that a part for DC of the tracking error signal TE in n frames may be measured. At this time, a part for DC35 of n frame 30 of the tracking error signal TE is measured by DC part monitor means 12a in drawing 2 .

[0044] Next, in drawing 3 , a part for DC of the tracking error signal TE in n+1 frame is measured at step S3. In drawing 1 , to DC part monitor means 12a of the tracking servo circuit 12 of the servo control circuit 5, specifically, the system-control circuit 19 supplies a control signal so that a part for DC of the tracking error signal TE in n+1 frame may be measured. At this time, a part for DC36 of n+1 frame 31 of the tracking error signal TE is measured by DC part monitor means 12a in drawing 2 .

[0045] And in drawing 3 , a part for DC of the tracking error signal TE in a n+m frame is measured by step S4 (here, m is the natural number and is the frame number of the image data of record or a regenerative signal.). In drawing 1 , the system-control circuit 19 changes the time amount to which only the n+m (for example, m= 4) frame of a part degree for optical disk 1 rotation (several frames) should carry out pause actuation from n frames to DC part monitor means 12a of the tracking servo circuit 12 of the servo control circuit 5, and specifically, it supplies a control signal so that a part for DC of the tracking error signal TE in each frame may be measured. At this time, a part for a part for a part for DC37 of n+2 frame 32 of the tracking error signal TE and DC38 of n+3 frame 33 and DC39 of n+4 frame 34 is measured by DC part monitor means 12a in drawing 2 , respectively. Thus, the monitor of the part for DC of the tracking error signal TE of the n+m frame of a part degree for optical disk 1 rotation (several frames) is carried out by DC part monitor means 12a from n frames. Here, the system-control circuit 19 memorizes a part for DC of the tracking error signal TE of a n-n+m frame in internal memory.

[0046] In drawing 3 , pause actuation is carried out to the last at step S5 by the fewest time amount for DC of the tracking error signal TE in n frames - a n+m frame. Specifically in drawing 1 , the system-control circuit 19 searches n - n+4 frame time corresponding to a part for DC of a frame with the smallest voltage level among those for DC 35, 36, 37, 38, and 39 of the tracking error signal TE in the time amount of 30, 31, 32, 33, and 34. The system-control circuit 19 supplies the control signal which starts a track jump in the location of the time amount for fewest DC36 which shows n+1 31 to the tracking servo circuit 12 of the servo control circuit 5. The tracking servo circuit 12 supplies a pulse to the tracking actuator of an optical pickup 2 so that one track jump may be started to this time amount of n+1 frame 31. Thus, pause actuation is performed to the inner circumference side of an optical disk 1 by the tracking actuator of an optical pickup 2 that there is no effect in a part for DC by [which is little time amount for fewest DC36] performing n+1 track jump [one] by the time amount of 31.
[0047] Thus, in the servo control circuit 5, since the digital servo by digital one PLL is performed, since the monitor of the part for DC of the tracking error signal TE can be carried out to the timing of the frame time of arbitration, in DC part monitor means 12a of the tracking servo circuit 12, it is not necessary to establish an addition circuit in others.
[0048]
[Effect of the Invention] The optical disk record regenerative apparatus of this invention moves an optical pickup on a record medium. In the optical disk record regenerative apparatus which position the above-mentioned optical pickup in the purpose truck location with a tracking means, and a light beam is made to glare on the above-mentioned record medium according to the optical system of the above-mentioned optical pickup, and records or reproduces a record mark In case the above-mentioned optical pickup is moved in the direction of a truck or the direction of a sector of the above-mentioned record medium, an offset component is detected from the tracking error signal of the above-mentioned tracking means. Since it was made to move in the location in which the above-mentioned offset component serves as min in the predetermined section DC gain of the case where eccentricity reproduces a record signal to a large record medium, and the tracking error signal from a tracking means does so the effect that stable track jump actuation can be carried out also by the system which is not fully securable.
[0049] Moreover, in ****, since it was made for migration of the above-mentioned optical pickup to be a track jump, even if the optical disk record regenerative apparatus of this invention is a record medium the amount of DC offset is, it does so the effect that pause actuation by the stable track jump can be carried out.
[0050] Moreover, in ****, since it was made for migration of the above-mentioned optical pickup to be one track jump by the side of the inner circumference of the above-mentioned record medium, even if the optical disk record regenerative apparatus of this invention is a record medium the amount of DC offset is, it does so the effect that pause actuation by one stable track jump can be carried out, by performing one track jump by the side of the inner circumference of a record medium in the location where an offset component serves as min.
[0051] Moreover, the optical disk record regenerative apparatus of this invention In ****, the predetermined section which detects the min of the above-mentioned offset component By moving in the location in which an offset component serves as min in the section for one rotation of an optical disk, since it was made to be the section for one rotation of the above-mentioned optical disk The effect that track jump actuation stabilized in the location where an offset component serves as min also to a record medium with large eccentricity can be carried out is done so.
[0052] Moreover, the optical disk record regenerative apparatus of this invention In ****, the predetermined section which detects the min of the above-mentioned offset component By moving in the location in which an offset component serves as min in the section for several frames of the regenerative signal of an optical disk, since it was made to be several frames of the regenerative signal of the above-mentioned optical disk The effect that track jump actuation stabilized in the location where an offset component serves as min also to a record medium with large eccentricity can be carried out is done so.

[Translation done.]

TECHNICAL FIELD

[The technical field to which invention belongs] This invention relates to the pause actuation at the time of using a light beam for the compact disc (CD-ROM) or recordable compact disk (CD-R) only for [an optical disk] playbacks, and recording or reproducing data.

[Translation done.]

PRIOR ART

[Description of the Prior Art] By progress of the multimedia which points to a highly informative society, much more high-performance-izing of an optical disk and large capacity-ization are called for. This optical disk can be divided roughly into two kinds, the mold optical disk only for playbacks of only reproducing the information data recorded at the time of disk cutting from that function and the purpose of use, and the write once optical disk whose rewriting can record only at once and is impossible.
[0003] In such an optical disk, it sets by requiring large capacity-ization at the time of disk cutting or a postscript. Only by the groove record method which records information data only on the groove section which consists of a slot spirally prepared on the record optical disk side Since the storage capacity demanded was not able to be satisfied, the land groove record method which records information data also on the portion called the land between the groove section and the groove section was adopted.
[0004] That is, in order to record information data on the predetermined truck on an optical disk, an optical pickup must be moved to up to the aim truck of an optical disk, and a laser beam must be made to glare on an aim truck in an optical disk record regenerative apparatus. For that, it is necessary to position an optical pickup to a target position. There is tracking servo system as servo system which moves an optical pickup to the location of the radial aim of an optical disk.
[0005] Tracking servo system consists of a tracking coil of the actuator systems in an optical pickup, and a tracking servo circuit. An actuator system carries out tracking actuation of the optical pickup minutely for example, with a biaxial actuator.
[0006] And if a laser beam pursues and carries out the tracking of the truck, reads the address and gets to know difference with the aim address, only the part will carry out minute seeking. Since it is difficult for stability to carry out seeking control when an eccentric speed is large at this time, it waits until an eccentric speed becomes small, and finally it reaches to an aim truck, and actuation of record is performed by the land groove record method which records information data on the land between the groove section on an optical disk, and the groove section.
[0007] The tracking by the push pull method used for the conventional land groove record method at drawing 4 is shown. The tracking by the conventional push pull method is explained using drawing 4 . In the land groove record method which records information data also on the portion called the lands L1, L2, and L3 between the groove sections G1 and G2, G3, and the groove sections G1 and G2 and G3 in drawing 4 A In order for the adjoining groove sections G1 and G2, G3, and the lands L1, L2, and L3 to record information data, it is necessary to perform tracking to each groove sections G1 and G2, G3, and lands L1, L2, and L3.
[0008] The push pull method is a method of detecting a tracking error, by taking out the light which carried out reflection diffraction by the groove sections G1 and G2 on the record thin film on an optical disk, and G3 as an output difference in respect of [where 2 ****s was taken on the photodiode] light-receiving. As shown in drawing 4 A, namely, a laser spot, the groove sections G1 and G2, the center of G3, Or when the center of the groove sections G1 and G2 called a laser spot and lands L1, L2, and L3, G3 and the groove sections G1 and G2, and the pars intermedia of G3 is in agreement After it carried out tracking and the truck has been in agreement, in drawing 4 B, the tracking error signal 101 as symmetrical reflection diffraction light distribution is acquired. In other than this, since tracking has not been carried out, it is in the condition from which the truck shifted, and they serve as a serpentine curve as reflection diffraction light distribution from which the amplitude from which optical reinforcement shifted in right and left differs. Thus, as the tracking error signal 101 is set to "0", tracking can be carried out to the groove sections G1 and G2, the center of G3, or the center of lands L1, L2, and L3.
[0009] Here, as shown in drawing 5 , offset might arise also with the inclination (radial tilt) of the radial direction of an optical disk 100. In drawing 5 , since it is the imbalance of optical reinforcement in order that the beam spot of the reflected light of an optical disk 100 may move only fand2deltatheta to the focal distance f of an objective lens 102 on a photodiode 103 when only deltatheta has an inclination in an optical disk 100 to the field which

intersects perpendicularly with the optical axis of a laser beam, a push pull signal will offset.
[0010] Therefore, since light and darkness appear on a photodiode 103 when there is the beam spot in the center of a photodiode 103, and the beam spot crosses the truck of an optical disk 100, and the zero crossing point of the tracking error signal 101 takes the truck lead, tracking can be performed using this tracking error signal 101. However, when the beam spot shifts from the center of a photodiode 103 and moves (at i.e., when [the time of an objective lens 102 driving to a radial direction by tracking actuation, and when a radial tilt is in an optical disk 100]), in order that the optical intensity distribution of the beam spot may move on a photodiode 103, a racking error signal turns into a signal which has a part for DC offset used as a wave with a late period. Tracking cannot be performed using the tracking error signal which has such offset.
[0011] For example, when spindle servo system will be in a lock condition, the halt equipment of the disk regenerative apparatus which has the timing modification circuit which changes a track jump is indicated by JP,4-132056,A. In performing pause actuation, it reads, whenever an optical disk rotates one time, and he carries out 1 track jump of the point in the direction of inner circumference (the read-out direction and hard flow), and is trying to repeat this 1 track-jump actuation in the optical disk currently recorded by the constant linear velocity (CLV) in this disk regenerative apparatus. The wave form chart of one track jump when performing the conventional pause actuation to drawing 6 is shown. As shown in drawing 6 , 1 track-jump wave 105 shown by the tracking error signal TE becomes the wave which has a part for the DC offset 106 at the period of the disk 1 rotation 104, and the amount of [107] DC offset appears similarly at the period of the disk 1 following rotation.

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention] An optical pickup is moved on a record medium ,and the optical disk record regenerative apparatus of this invention is a tracking means about the above-mentioned optical pickup. In the optical disk record regenerative apparatus which position in the purpose truck location, and a light beam is made to glare on the above-mentioned record medium according to the optical system of the above-mentioned optical pickup, and records or reproduces a record mark In case the above-mentioned optical pickup is moved in the direction of a truck or the direction of a sector of the above-mentioned record medium, an offset component is detected from the tracking error signal of the above-mentioned tracking means. Since it was made to move in the location in which the above-mentioned offset component serves as min in the predetermined section DC gain of the case where eccentricity reproduces a record signal to a large record medium, and the tracking error signal from a tracking means does so the effect that stable track jump actuation can be carried out also by the system which is not fully securable.
[0049] Moreover, in ****, since it was made for migration of the above-mentioned optical pickup to be a track jump, even if the optical disk record regenerative apparatus of this invention is a record medium the amount of DC offset is, it does so the effect that pause actuation by the stable track jump can be carried out.
[0050] Moreover, in ****, since it was made for migration of the above-mentioned optical pickup to be one track jump by the side of the inner circumference of the above-mentioned record medium, even if the optical disk record regenerative apparatus of this invention is a record medium the amount of DC offset is, it does so the effect that pause actuation by one stable track jump can be carried out, by performing one track jump by the side of the inner circumference of a record medium in the location where an offset component serves as min.
[0051] Moreover, the optical disk record regenerative apparatus of this invention is the predetermined section which detects the min of the above-mentioned offset component in ****, Since it was made to be the section for one rotation of the above-mentioned optical disk, the effect that track jump actuation stabilized in the location where an offset component serves as min also to a record medium with large eccentricity can be carried out is done so by moving in the location in which an offset component serves as min in the section for one rotation of an optical disk.
[0052] Moreover, the optical disk record regenerative apparatus of this invention is the predetermined section which detects the min of the above-mentioned offset component in ****, Since it was made to be several frames of the regenerative signal of the above-mentioned optical disk, the effect that track jump actuation stabilized in the location where an offset component serves as min also to a record medium with large eccentricity can be carried out is done so by moving in the location in which an offset component serves as min in the section for several frames of the regenerative signal of an optical disk.

[Translation done.]

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] Thus, since pause actuation by one track jump was performed without regarding a part for this DC offset at all although the amount of [by the optical intensity distribution of the beam spot moving on a photodiode 103] DC offset appeared when a radial tilt was in an optical disk 100, there was un-arranging [that the pause actuation by one track jump became unstable] in 1 track-jump wave when performing the conventional pause actuation.
[0013] This invention is made in view of this point, and aims at offer of the optical disk record regenerative apparatus which can perform pause actuation stabilized even if the amount of DC offset was.

[Translation done.]

MEANS

[Means for Solving the Problem] An optical disk record regenerative apparatus of this invention moves an optical pickup on a record medium. In an optical disk record regenerative apparatus which position the above-mentioned optical pickup in the purpose truck location with a tracking means, and a light beam is made to glare on the above-mentioned record medium according to optical system of the above-mentioned optical pickup, and records or reproduces a record mark In case the above-mentioned optical pickup is moved in the direction of a truck or the direction of a sector of the above-mentioned record medium, an offset component is detected from a tracking error signal of the above-mentioned tracking means, and it is made to move in a location in which the above-mentioned offset component serves as min in the predetermined section.
[0015] According to the optical disk record regenerative apparatus of this invention, the following operations are carried out. This optical disk record regenerative apparatus moves an optical pickup on a record medium, positions the above-mentioned optical pickup in the purpose truck location with a tracking means, makes a light beam glare on the above-mentioned record medium according to optical system of the above-mentioned optical pickup, and records or reproduces a record mark. Moreover, this optical disk record regenerative apparatus detects an offset component from a tracking error signal of the above-mentioned tracking means. And this optical disk record regenerative apparatus moves the above-mentioned optical pickup in the direction of a truck or the direction of a sector of the above-mentioned record medium in a location in which the above-mentioned offset component serves as min in the predetermined section.
[0016]
[Embodiment of the Invention] Below, the gestalt of this operation is explained. The optical disk which applies the gestalt of this operation is a compact disc (CD). There are some families in CD and there are CD-ROM only for playbacks and a CD-R which can be written in only once. The gestalt of this operation is applied to this CD family.

[0017] Next, the configuration of the gestalt of this operation applied to such an optical disk is shown. Drawing 1 is the block diagram showing the configuration of the optical disk record regenerative apparatus of the gestalt of this operation. First, the configuration of an optical disk record regenerative apparatus is explained. The optical disk record regenerative apparatus of this example has the servo control circuit 5 which controls an optical disk rotation drive control system, a coarse adjustment delivery drive control system, and each servo system of an optical pickup control system, the laser control circuit 6 which controls the laser power supplied to an optical pickup 2, the I-V transformation-matrix circuit 8 which acquires a playback RF signal, a focal error signal, and a tracking error signal from the reflected light of laser, and the signal-control circuit 7.
[0018] An optical disk rotation drive control system has the spindle servo circuit 9, a spindle motor 3, and an optical disk 1. Here, an optical disk 1 constitutes a record medium. A coarse adjustment delivery drive control system has the thread servo circuit 10 and the thread motor 4. An optical pickup control system has an optical pickup 2, the I-V transformation-matrix circuit 8, the focus servo circuit 11, the tracking servo circuit 12, and the laser control circuit 6. The photodiode 21 with which the I-V transformation-matrix circuit 8 detects the reflected light of laser by two parting planes here, The adder 22 adding 2 division signals, and the subtractor 23 which subtracts 2 division signals, The RF amplifying circuit 24 which supplies a servo signal to the thread servo circuit 10 while amplifying a playback RF signal from the output of an adder 22, It has the focal error detection circuit 25 which detects a focal error signal from the output of a subtractor 23, and the tracking error detector 26 which detects a tracking error signal from the output of a subtractor 23. Moreover, the laser control circuit 6 has the PWM driver 14 who carries out Pulse Density Modulation of the laser light, and the laser diode 13 which emits light in laser light.
[0019] A signal-control circuit 7 has the system-control circuit 19 which controls each part of equipment, the ECC encoding circuit 16 which adds an error correction code to record data with the Lead Solomon product code, the

modulation circuit 15 which carries out eight-to-fourteen modulation of the record data with which the error correction code was added, the demodulator circuit 17 which supply a servo signal to a spindle servo circuit 9 while carrying out the EFM recovery of the playback data, and the ECC decoding circuit 18 which carry out error correction processing with the Lead Solomon product code, and output playback data to playback data.

[0020] Here, a monitor is carried out by the period of an optical disk's 1 1 rotation of a part for DC offset by the optical intensity distribution of the beam spot by the radial tilt of an optical disk 1 moving to the tracking servo circuit 12 on a photodiode 21, and it consists of especially this example so that it may have DC monitor means 12a which searches the time amount which carries out pause actuation by one track jump to stability.

[0021] Next, the connection relation of an optical disk record regenerative apparatus is shown. First, the connection relation of an optical disk rotation drive control system is shown. The spindle servo circuit 9 is connected with a spindle motor 3, and a spindle motor 3 is connected with an optical disk 1 through a rolling mechanism.

[0022] Next, the connection relation of a coarse adjustment delivery drive control system is shown. The thread servo circuit 10 is connected with the thread motor 4, and the thread motor 4 is connected with the optical pickup 2 of an optical pickup control system through a rough delivery device.

[0023] Next, the connection relation of an optical pickup control system is shown. An optical pickup 2 is connected with the photodiode 21 of the I-V transformation-matrix circuit 8, two split outputs of a photodiode 21 are connected with a subtractor 23 while connecting with an adder 22, and an adder 22 and a subtractor 23 are connected with the focal error detection circuit 25 and the tracking error detector 26 while connecting with the RF amplifying circuit 24.

[0024] Moreover, the focal error detection circuit 25 and the tracking error detector 26 are connected with the focus servo circuit 11 and the tracking servo circuit 12, and the focus servo circuit 11 and the tracking servo circuit 12 are connected to the focal coil and tracking coil which an optical pickup 2 does not illustrate.

[0025] Next, the connection relation of a signal-processing system is shown. The RF amplifying circuit 24 is connected with the demodulator circuit 17 of the signal-control circuit 7, and a demodulator circuit 17 is connected with the ECC decoding circuit 18. Moreover, the ECC encoding circuit 16 is connected with a modulation circuit 15, a modulation circuit 15 is connected with the PWM driver 14 of the laser control circuit 6, and the PWM driver 14 is connected with laser diode 13, and laser diode 13 is formed so that a predetermined laser beam may be formed in an optical pickup 2.

[0026] Moreover, the optical disk record regenerative apparatus is connected with the host computer through the system controller 19 and the interface circuitry which is not illustrated.

[0027] Thus, outline actuation of the constituted optical disk record regenerative apparatus is explained. when the instruction from the host computer which is not a drawing example performs record or playback of an information signal to an optical disk record regenerative apparatus, after making seek operation the aim truck location on an optical disk 1 by the thread motor 4 and positioning an optical pickup 2 in it from a host computer, make a tracking coil and a focal coil drive by the tracking servo circuit 12 and the focus servo circuit 11, tracking and a focus are made to tune finely, and it doubles with desired value.

[0028] While eliminating the information on the portion which makes leather power erasion power level beforehand by the laser control circuit 6, and is not recorded in the case of record, the information signal which adjusted leather power to light power level, recorded the information signal on the aim truck location, adjusted leather power to lead power level by the laser control circuit 6 on the occasion of playback, and was recorded on the aim truck location is reproduced.

[0029] By the signal-control system, the system-control circuit 19 supplies the command of a rotation instruction to the spindle servo circuit 9 of the servo control circuit 5 first based on a host computer. The spindle servo circuit 9 supplies a drive signal to a spindle motor 3 with this command, and rotates a spindle motor 3. The servo signal by which synchronous detection was carried out from the demodulator circuit 17 based on the playback RF signal is supplied to the spindle servo circuit 9.

[0030] Next, based on a host computer, the system-control circuit 19 supplies the command of a rough delivery instruction to the thread servo circuit 10. An optical pickup 2 reads the information signal of a current location in an optical disk 1, and supplies a RF signal, an addition signal, and a subtraction signal to the RF amplifying circuit 24, the focal error detection circuit 25, and the tracking error detector 26 through a photodiode 21, an adder 22, and a subtractor 23. The tracking error detector 26 generates a tracking error signal from a difference signal, and supplies it to the thread servo circuit 10. The thread servo circuit 10 generates a drive signal based on a tracking error signal, and supplies a drive signal to the thread motor 4. The thread motor 4 carries out rough seek operation of the optical pickup 2 through the rough delivery device which is not illustrated based on a drive signal.

[0031] Actuation of seeking servo system consists of two, thread motor 4 system and the actuator system in an optical pickup 2. Thread motor 4 system carries out rough seek operation of the optical pickup 2 by the thread

motor 4, and positions by detecting a location with the encoder which is not illustrated. An actuator system carries out minute seek operation of the optical pickup 2 with the biaxial actuator using the tracking coil which is not illustrated.

[0032] Such an operating sequence of seeking servo system is explained below. First, rough seek operation is carried out to near the target truck location. Rough seeking is carried out, and even if an optical pickup 2 stops near the aim address, it does not immediately stop, but it vibrates, and the moving part of the actuator in an optical pickup 2 waits for the predetermined settling time, and stops.

[0033] Next, in order to read the address information which reached, truck drawing-in actuation is carried out. Here, when truck eccentricity speed is large, activation of truck drawing-in actuation is drawn, and it waits for this actuation until it is that of a lifting or a cone and an eccentric speed becomes near the zero about an error.

[0034] And if a laser beam pursues a truck, makes a tracking coil drive with the drive signal from the tracking servo circuit 12, carries out tracking by on-truck, reads the address and gets to know difference with the aim address, only the part will carry out minute seeking. At this time, an optical pickup 2 reads the information signal of a current location in an optical disk 1, and supplies it to the tracking error detector 26.

[0035] That is, a photodiode 21 receives the laser beam reflected with the optical disk 2 on 2 parting planes. A photodiode 21 changes into an electrical signal 2 division laser beam which received light, and supplies it to a subtractor 23. A subtractor 23 subtracts 2 division signals and generates a difference signal. The tracking error detector 26 detects a tracking error signal from a difference signal, and supplies it to the tracking servo circuit 12. The tracking servo circuit 12 performs the tracking of an optical pickup 2 with the tracking coil of the biaxial actuator which is not illustrated based on a tracking error signal. Moreover, the focal error detection circuit 25 detects a focal error signal from an information signal, and supplies it to the focus servo circuit 11. The focus servo circuit 11 performs focusing of an optical pickup 2 with the focal coil of the biaxial actuator which is not illustrated based on a focal error signal.

[0036] Since it is difficult for stability also at this time to carry out seeking control when an eccentric speed is large, it waits until an eccentric speed becomes small, and finally it reaches to an aim truck, and actuation of record or playback is performed.

[0037] After positioning an optical pickup 2 in an aim truck location, actuation of record or playback is performed as follows. At the time of playback, the system-control circuit 19 supplies a playback command to the PWM driver 14 of the laser control circuit 6. The PWM driver 14 adjusts laser luminescence power to playback power level, and supplies it to laser diode 13. Laser diode 13 irradiates laser light through a lens at an optical disk 1. A photodiode 21 receives the laser beam reflected with the optical disk 1 on 2 parting planes. A photodiode 21 changes into an electrical signal 2 division laser beam which received light, and supplies it to an adder 22. An adder 22 adds 2 division signals and generates a playback RF signal.

[0038] A playback RF signal is supplied to the RF amplifying circuit 24. The RF amplifying circuit 24 carries out RF amplification of the playback data, and supplies it to a demodulator circuit 17. A demodulator circuit 17 carries out the EFM recovery of the playback data. A demodulator circuit 17 supplies the playback data to which it restored to the ECC decoding circuit 18. The ECC decoding circuit 18 carries out error correction processing with the Lead Solomon product code, and outputs playback data to playback data. The decoded information signal is supplied to a host computer.

[0039] At the time of record, the system-control circuit 19 supplies a record command to the PWM driver 14 of the laser control circuit 6. The record data supplied from the host computer is supplied to the ECC encoding circuit 16. The ECC encoding circuit 16 adds an error correction sign to record data with the Lead Solomon product code. The ECC encoding circuit 16 supplies the record data with which the error correction sign was added to a modulation circuit 15. A modulation circuit 15 carries out eight-to-fourteen modulation of the record data with which the error correction code was added. A modulation circuit 15 supplies the modulated record data to the PWM driver 14 of the laser control circuit 6. The PWM driver 14 does Pulse Density Modulation of the record data by which eight-to-fourteen modulation was carried out based on the record command, and supplies the laser flashing caution signal of light power level to laser diode 13. Laser diode 13 irradiates a laser beam through a lens at an optical disk 1. After the record thin film of an optical disk 1 was heated and has made it amorphous by the laser beam, record data is recorded on an aim truck location.

[0040] By DC monitor means 12a of the tracking servo circuit 12, a monitor is carried out by the period of an optical disk's 1 1 rotation of a part for DC offset by the optical intensity distribution of the beam spot by the radial tilt of an optical disk 1 moving on a photodiode 21, the amount of this DC offset searches the minimum time amount, and especially the gestalt of this operation here is made to carry out pause actuation by one track jump to stability by this time amount.

[0041] First, the sequence of 1 track-jump actuation of such track jump servo system of minute seeking is

explained below. First, minute seek operation is carried out to near the location by the side of 1 truck inner circumference made into an aim. One track jump of minute seeking is actuation to which a light beam is moved by one truck by adding pulse current to the moving part of the actuator in an optical pickup 2, suspending an optical pickup 2 to the aim address.

[0042] That is, if a laser beam pursues a truck, makes a tracking coil drive with the drive signal from the tracking servo circuit 11, carries out tracking by on-truck, reads the address and gets to know the difference for one truck with the aim address, only the difference for the one truck will carry out minute seeking. At this time, an optical pickup 2 reads the information signal of a current location in an optical disk 1, and supplies it to the tracking error detector 26.

[0043] Hereafter, actuation of DC part monitor in such pause actuation is explained. The flow chart is shown in the wave form chart of DC part monitor for several frames of pause actuation of the gestalt of this operation to drawing 2 , and drawing 3 . As shown in drawing 3 , there is a pause demand from a host side at step S1 at n frames (here, n is the natural number and is the frame number of the image data of record or a regenerative signal.). Specifically in drawing 1 , the command of a pause demand is supplied to the system-control circuit 19 of the signal-control circuit 7 in n frames from a host computer. At step S2, a part for DC of the tracking error signal TE in n frames is measured. In drawing 1 , to DC part monitor means 12a of the tracking servo circuit 12 of the servo control circuit 5, specifically, the system-control circuit 19 supplies a control signal so that a part for DC of the tracking error signal TE in n frames may be measured. At this time, a part for DC35 of n frame 30 of the tracking error signal TE is measured by DC part monitor means 12a in drawing 2 .

[0044] Next, in drawing 3 , a part for DC of the tracking error signal TE in n+1 frame is measured at step S3. In drawing 1 , to DC part monitor means 12a of the tracking servo circuit 12 of the servo control circuit 5, specifically, the system-control circuit 19 supplies a control signal so that a part for DC of the tracking error signal TE in n+1 frame may be measured. At this time, a part for DC36 of n+1 frame 31 of the tracking error signal TE is measured by DC part monitor means 12a in drawing 2 .

[0045] And in drawing 3 , a part for DC of the tracking error signal TE in a n+m frame is measured by step S4 (here, m is the natural number and is the frame number of the image data of record or a regenerative signal.). In drawing 1 , the system-control circuit 19 changes the time amount to which only the n+m (for example, m= 4) frame of a part degree for optical disk 1 rotation (several frames) should carry out pause actuation from n frames to DC part monitor means 12a of the tracking servo circuit 12 of the servo control circuit 5, and specifically, it supplies a control signal so that a part for DC of the tracking error signal TE in each frame may be measured. At this time, a part for a part for a part for DC37 of n+2 frame 32 of the tracking error signal TE and DC38 of n+3 frame 33 and DC39 of n+4 frame 34 is measured by DC part monitor means 12a in drawing 2 , respectively. Thus, the monitor of the part for DC of the tracking error signal TE of the n+m frame of a part degree for optical disk 1 rotation (several frames) is carried out by DC part monitor means 12a from n frames. Here, the system-control circuit 19 memorizes a part for DC of the tracking error signal TE of a n-n+m frame in internal memory.

[0046] In drawing 3 , pause actuation is carried out to the last at step S5 by the fewest time amount for DC of the tracking error signal TE in n frames - a n+m frame. Specifically in drawing 1 , the system-control circuit 19 searches n - n+4 frame time corresponding to a part for DC of a frame with the smallest voltage level among those for DC 35, 36, 37, 38, and 39 of the tracking error signal TE in the time amount of 30, 31, 32, 33, and 34. The system-control circuit 19 supplies the control signal which starts a track jump in the location of the time amount for fewest DC36 which shows n+1 31 to the tracking servo circuit 12 of the servo control circuit 5. The tracking servo circuit 12 supplies a pulse to the tracking actuator of an optical pickup 2 so that one track jump may be started to this time amount of n+1 frame 31. Thus, pause actuation is performed to the inner circumference side of an optical disk 1 by the tracking actuator of an optical pickup 2 that there is no effect in a part for DC by [which is little time amount for fewest DC36] performing n+1 track jump [one] by the time amount of 31.

[0047] Thus, in the servo control circuit 5, since the digital servo by digital one PLL is performed, since the monitor of the part for DC of the tracking error signal TE can be carried out to the timing of the frame time of arbitration, in DC part monitor means 12a of the tracking servo circuit 12, it is not necessary to establish an addition circuit in others.

[0048]

[Translation done.]

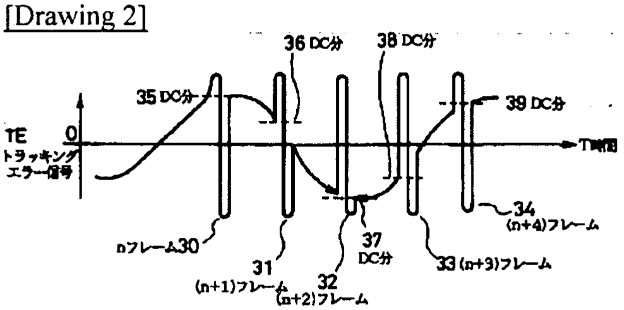
DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the block diagram showing the configuration of the optical disk record regenerative apparatus of the gestalt of this operation.
[Drawing 2] It is the wave form chart showing DC monitor for several frames of pause actuation of the gestalt of this operation.
[Drawing 3] It is flow chart drawing showing DC monitor for several frames of pause actuation of the gestalt of this operation.
[Drawing 4] It is drawing showing the tracking by the conventional push pull method, drawing 4 A is drawing showing Land L and Groove G, and drawing 4 B is drawing showing a tracking error signal.
[Drawing 5] It is drawing showing offset by the inclination of the conventional optical disk.
[Drawing 6] It is the wave form chart showing one track jump of the conventional pause actuation.
[Description of Notations]
1 [-- Thread motor,] -- An optical disk, 2 -- An optical pickup, 3 -- A spindle motor, 4 5 -- A servo control circuit, 6 -- A laser control circuit, 7 -- Signal-control circuit, 8 -- An I-V transformation-matrix circuit, 9 -- A spindle servo circuit, 10 -- Thread servo circuit, 11 -- A focus servo circuit, 12 -- By the tracking servo circuit and 12 a--DC, monitor means, 13 -- Laser diode, 14 -- An PWM driver, 15 -- Modulation circuit, 16 -- An ECC encoding circuit, 17 -- A demodulator circuit, 18 -- ECC decoding circuit, 19 [-- An adder, 23 / -- A subtractor, 24 / -- RF amplifier, 25 / -- A focal error detection circuit, 26 / -- Tracking error detector] -- A system-control circuit, 20 -- A collimator lens, 21 -- A photodiode, 22

[Translation done.]

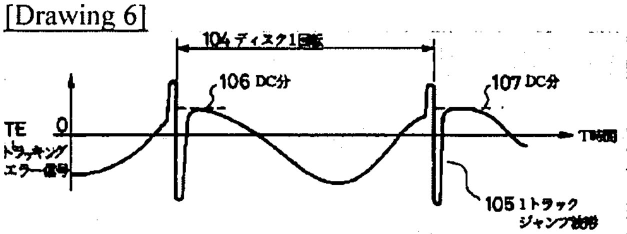
DRAWINGS

[Drawing 2]



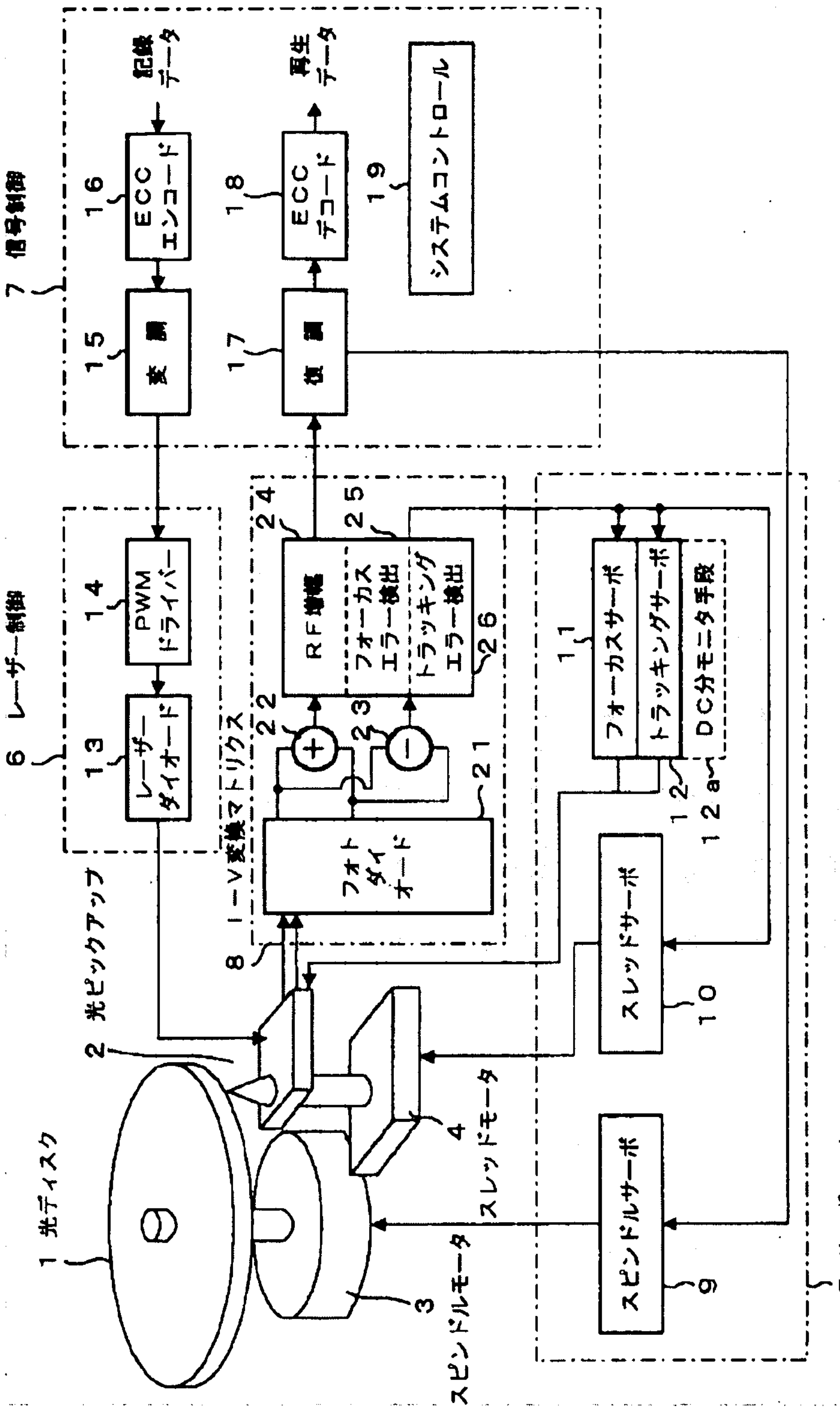
本実施の形態のポーズ動作の数フレーム分のDC分モニタを示す波形図

[Drawing 6]



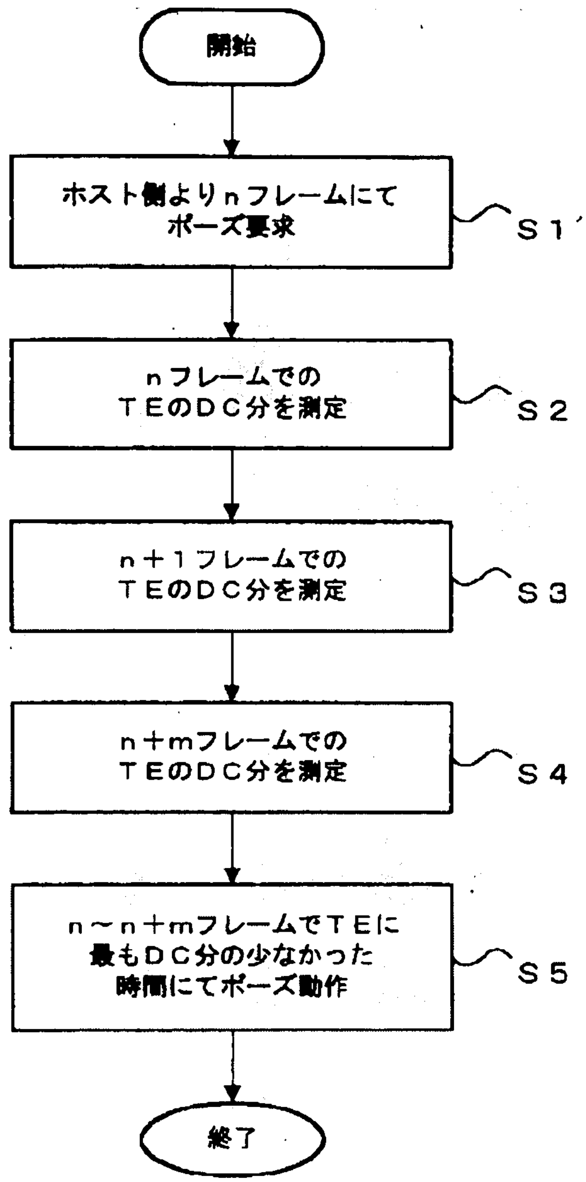
従来のポーズ動作のときの1トラックジャンプを示す波形図

[Drawing 1]



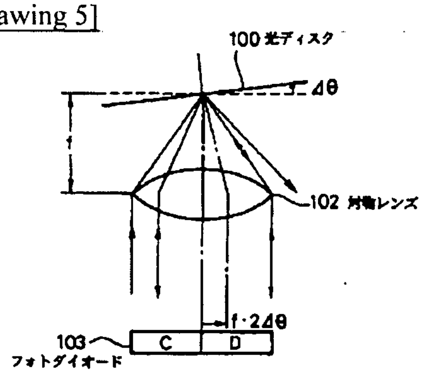
本実施の形態の光ディスク記録再生装置の構成を示すブロック図

[Drawing 3]



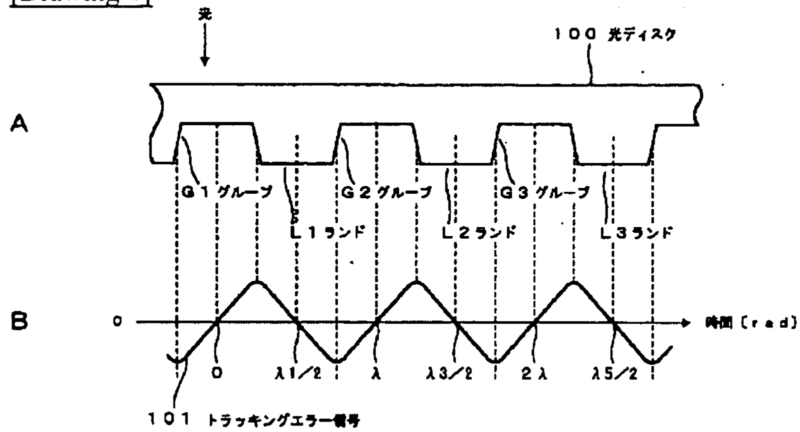
本実施の形態のポーズ動作の数フレーム分の
ＤＣ分モニタを示すフローチャート

[Drawing 5]



従来の光ディスクの傾きによる
オフセットを示す図

[Drawing 4]



従来のプッシュプル法によるトラッキングを示す図

[Translation done.]

PATENT ABSTRACTS OF JAPAN

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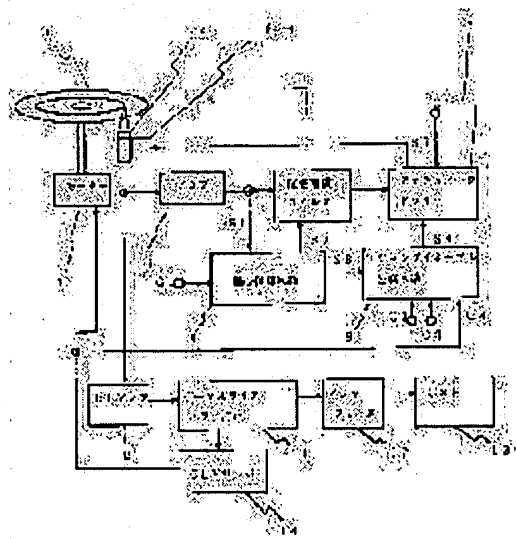
(72)Inventor : SAITO NOBUYUKI

(54) OPTICAL DISK DEVICE AND OPTICAL DISK DRIVING METHOD

(57)Abstract:
PROBLEM TO BE SOLVED: To improve the random access stability of data and the speed in optical disk memory devices such as a CD-ROM drive.
SOLUTION: In an optical disk track servo mechanism, the device is provided with an eccentricity detecting circuit 8 which discriminates the direction of the eccentricity of a disk and acceleration from the conditions of track error signals when a track jump command is generated and a track jump enable signal generating circuit 9 which determines the track jump start timing from the obtained eccentricity condition, the track jump direction, the number of jumps and the relationship with the present disk number of revolutions. Having these circuits 8 and 9, a jump is executed with an optimum timing against the disk eccentricity. Note that the stability and the sureness of a track jump are improved because the track jump is conducted by observing the conditions of the optical disk eccentricity (the acceleration and the direction) and waiting for the execution of the jump till the size and the direction of the optimum eccentricity acceleration are obtained.



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* NOTICES *

CLAIMS

[Claim(s)]

[Claim 1] An optical disk unit which has a truck error signal generating circuit which is characterized by providing the following, and which generates a truck error signal, and a means to drive an actuator so that said truck error signal may be set to 0 based on an output of a phase compensating filter and this filter to the extent that phase compensation of this truck error signal is carried out An eccentric detection means to detect sense and acceleration of eccentricity of a disk based on a truck error signal, and to output this eccentric information in response to a command which jumps a truck A track jump enable signal generating means to generate a track jump enable signal which shows track jump initiation timing based on this eccentric information, the direction of a track jump, and a current disk rotation period A jump signal generating circuit which generates a jump signal which receives this track jump enable signal and carries out movable [of said actuator]

[Claim 2] Said jump command is an optical disk unit according to claim 1 characterized by generating a track jump enable signal which shows said track jump initiation timing based on this count information of a jump including count information of a jump.

[Claim 3] An optical disk unit according to claim 1 characterized by providing the following. A truck zero cross comparator which carries out the party rate of said truck error signal with signal level in case the beam spot of an optical pickup is on a truck, and generates a binary-ized signal Said eccentric detecting circuit which has a gain down signal generating circuit at least for the above to lower gain of a servo band of a phase compensating filter, and enlarge amplitude of this truck error signal, amplitude carries out the party rate of the truck error signal which became large with this truck zero cross comparator by gain down, makes it binary in response to said track jump command, and acquires said eccentric information on a disk from level of a truck zero cross signal after a party rate, and an edge

[Claim 4] An optical disk unit including said eccentric detecting circuit which at least the above carries out adjustable [of the frequency response characteristic of a phase compensating filter], has a hold signal generating circuit which holds a control signal to said truck actuator, and a sample circuit which samples a value of a truck error signal produced by holding an optical pickup with a fixed time interval, computes a condition of eccentricity in response to said track jump command from variation and sampling time of a truck error signal by which the sample was carried out, and outputs said eccentric information according to claim 1.

[Claim 5] Were set based on said jump direction, said number information of jump trucks, and spindle rotation period information. It has a storage means to memorize range data of magnitude of eccentric acceleration and range data of the eccentric direction suitable for a track jump as a window. An optical disk unit according to claim 1 or 3 characterized by including said track jump enable signal generating circuit which generates a track jump enable signal when said eccentric acceleration which said eccentric detecting circuit outputs, and said eccentric direction enter in a predetermined window.

[Claim 6] A truck error signal generating circuit which generates a truck error signal It is a phase compensating filter to the extent that phase compensation of this truck error signal is carried out. A means to drive an actuator so that said truck error signal may be set to 0 based on an output of this filter It is characterized by to be the drive method of an optical disk equipped with the above, to detect sense and acceleration of eccentricity of a disk based on a truck error signal, to output this eccentric information in response to a command which jumps a truck, to generate the track jump enable signal which shows track jump initiation timing based on this eccentric information, the direction of a track jump, and a current disk rotation period, to receive this track jump enable signal and to generate the jump signal which carries out movable [of said actuator].

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] About the random access method of optical disk memory equipment, this invention eliminates the effect of a tracking servo device, especially the disk eccentricity at the time of jump initiation as much as possible, and relates to the method of making an optical pickup jumping to stability and the target truck certainly.
[0002]
[Description of the Prior Art] The track jump method of conventional optical disk memory equipment is explained using drawing 1 and drawing 7 . Drawing 1 shows the outline configuration of a drive of CD-ROM which is optical disk memory equipment only for playbacks. 1 is an optical disk, and as a list of the pit where minute length is different, from disk inner circumference, digital information is missing from a periphery and is spirally recorded on this disk, an optical pickup 2 amplifies the reflected light from the disk of laser diode with a photodiode, amplifies reception and it with amplifier, and it is reproducing data. RF amplifier 10 amplifies the output of the photodiode of an optical pickup, and passes it to a data slice and the error correction block 11. CD-ROM is performing rotational-speed control called the CLV servo which keeps the linear velocity of a disk constant, in order to read data to the inner circumference of a disk, and a periphery with ****** and a fixed data rate. The CLV servo 14 outputs the signal C4 which controls a spindle motor so that reception and the data period read become fixed about the signal from a data slice and an error correction block to a spindle motor. The data after an error correction goes into the interface block 12 with a host with a data slice and an error correction block, and data is outputted to a host computer 13 according to a specific format.
[0003] However, as an error on a disk and manufacture of a drive, in CD-ROM, there is no axis of rotation of a disk strictly centering on a disk, and it has in it the eccentricity below the value which becomes settled by specification. Although fine cut in the shape of a spiral toward the periphery from the most inner circumference in fact, since distance with the next truck is very detailed, they are explained that the data tracks minced on the disk have the shape of a concentric circle centering on the axis of rotation in approximation. It sees from an optical pickup, and the truck will be observed [when the data tracks of a certain arbitration were observed with the view which stood it still to the earth and a disk rotates at high speed] as it is vibrating the rotation period to radial, without being visible with one stationary line, as shown in drawing 7 , since the axis of rotation has eccentricity.
[0004] In CD-ROM, a disk radial truck gap is 1.6 micrometers, and since the maximum eccentricity defined by specification is **70 micrometers or less, the truck of ten numbers per rotation will cross an optical pickup by the eccentric component. So, in order to reproduce data, rotating a disk and tracing one truck, the truck servo for making an optical pickup follow the target truck is needed.
[0005] The amplifier of 3 generates S1 for the truck error signal which shows the error of which the reflected light of a disk is calculated and a laser spot has from the target truck, and inputs at least that of 4 into a phase compensating filter. Since the transfer characteristics of the actuator 6 to which it carries out movable [of the optical pickup] are behind [180 degrees] in the phase in the point that a loop gain is set to 0dB, the way things stand, a system is not stabilized by them. Then, at least that of 4 advances the phase in the frequency from which gain is set to 0dB with a phase compensating filter, and is maintaining the system at stability. Moreover, the role which raises the loop gain of a band which wants to oppress a truck error signal is also played. The actuator driver of 5 generates the drive signal S5 for carrying out movable [of the actuator 6 of reception and an optical pickup] for the output of the phase compensating filter 4.
[0006] With the drive signal S5, an actuator 6 carries out movable to radial [of a disk] so that a truck error signal may be oppressed, and it performs actuation which is always followed to the target truck by continuing the above actuation.
[0007] In this CD-ROM equipment, in order to access the target data, the device which jumps a truck is established by moving an optical pickup to the disk radial by the command from a control means (not shown). Generally, although the actuator which carries out movable [of the optical pickup] to the disk radial in CD-ROM equipment has two lines of the rough actuator (the movable range of about 30mm) which slides an optical pickup to the disk radial in order to reproduce the data currently spirally recorded as the energy actuator (about 100 micrometers of movable range of numbers) for following eccentricity, especially by explanation of this invention, it is not distinguished but only let it be an actuator.
[0008] Generally a track jump is performed by the following actuation. Truck servo actuation is temporarily interrupted by the track jump command from a control means, and an actuator driver generates the kick signal which moves the actuator of an optical pickup in disk inner circumference or the direction of a periphery. If an actuator operates and an optical pickup

begins to move to the disk radial, counting of the number of trucks crossed from the wave of the truck error signal under pickup migration and a data signal will be carried out. If it judges that it reached to the target truck from the number of trucks by which counting was carried out, truck servo actuation will be resumed and reading of data will be begun.

[0009]

[Problem(s) to be Solved by the Invention] However, by the method of the conventional track jump, since the direction of the truck horizontal end speed by disk eccentricity became large depending on [passing speed / of an optical pickup] the timing of track jump initiation to increase of the disk eccentricity accompanying improvement in the speed of disk rotational speed, with the direction to carry out an appearance top track jump, the optical pickup may have moved to reverse and the phenomenon which does not reach to the target truck may have arisen. In this case, disk data must be read again, a jump must be redone and the problem that arriving at the target truck as a result will take time amount is produced.

[0010] The rotational speed of a disk is also accelerated with the twice of digital audio playback, 4 times, and 8 times as CD will accomplish evolution from digital audio playback to the use as data-logging media for multimedia in recent years, if CD (compact disk) is taken for an example. Since rotational-speed control called the CLV servo which keeps the linear velocity of a disk constant in order that CD may read data to the inner circumference of a disk and a periphery with ****** and a fixed data rate is performed, when the optical pickup is tracing the truck near the most inner circumference of a disk, the rotational speed of a disk becomes a high speed most. Although the maximum eccentricity is not dependent [the angular velocity of disk rotation], and fixed when reproducing data by one 8 times the data transfer rate of this to the data transfer rate for the usual digital audios, it depends for the maximum eccentricity acceleration on rotational angular frequency. That is, eccentricity and eccentric acceleration are expressed with the following formulas. xo shows the maximum eccentricity displacement.

[0011]

Displacement X=xo-sinomegat (1)

Eccentric acceleration d2 x/dt2=-xo-omega 2sinomegat=-omega2x (2)

a top type -- eccentricity -- it turns out that the relation between displacement and change-of-mind acceleration serves as a sine wave from which a phase differs 180 degrees. When 140 micrometers and disk linear velocity at the time of the usual digital audio playback are carried out for the maximum eccentricity in 1.4m/s here, the angle-of-rotation frequency in the disk most inner circumference is as follows.

[0012] omega=2pif= linear velocity / most-inner-circumference radius = depending 1.4/0.025=56, the maximum eccentricity acceleration serves as d2 x/dt2=562 and 140e-6=0.44 m/s2.

[0013] Moreover, supposing it reads data by one 8 times the linear velocity of this, similarly, by the most inner circumference of a disk, it is set to omega=2pif=11.2/0.025=448 maximum eccentricity acceleration =4482 and 140e-6=28.1m/s2, and will have 8x8=64 time [of the very usual digital audio] eccentric acceleration.

[0014] Thus, if rotational speed of a disk is made high in order to raise a data transfer rate, in connection with it, eccentric acceleration will become large by the square. For this reason, the phenomenon which an optical pickup moves to eccentric acceleration, the sense to perform a track jump depending on the timing at the time of jump initiation, and the reverse sense may occur. Moreover, at the time of truck servo drawing in at the time of jump convergence, since a disk radial relative velocity of an optical pickup and a truck is too large, a possibility that a servo cannot be drawn is also produced.

[0015] From the background mentioned above, by this invention, the effect of the eccentricity of the optical disk in the conventional track jump method is eliminated as much as possible, and how to perform a stable track jump is stated.

[0016]

[Means for Solving the Problem] In order to solve the above-mentioned technical problem, an optical disk unit and an optical disk drive method of this invention A truck error signal generating circuit which generates a truck error signal, (Means 1) In an optical disk unit which has a means to drive an actuator so that said truck error signal may be set to 0 based on an output of a phase compensating filter and this filter to the extent that phase compensation of this truck error signal is carried out An eccentric detection means to detect sense and acceleration of eccentricity of a disk based on a truck error signal, and to output this eccentric information in response to a command which jumps a truck, A track jump enable signal generating means to generate a track jump enable signal which shows track jump initiation timing based on this eccentric information, the direction of a track jump, and a current disk rotation period, An optical disk unit characterized by receiving this track jump enable signal and having a jump signal generating circuit which generates a jump signal which carries out movable [of said actuator].

[0017] (Means 2) Said jump command is the optical disk unit of means 1 publication characterized by generating a track jump enable signal which shows said track jump initiation timing based on this count information of a jump including count information of a jump.

[0018] A truck zero cross comparator which carries out the party rate of said truck error signal with signal level in case the beam spot of an optical pickup is on a truck, and generates a binary-ized signal, (Means 3) It has a gain down signal generating circuit at least for the above to lower gain of a servo band of a phase compensating filter, and enlarge amplitude of this truck error signal in response to said track jump command. By gain down, with this truck zero cross comparator, carry out the party rate of the truck error signal to which amplitude became large, and it is made binary. An optical disk unit of means 1 publication characterized by having said eccentric detecting circuit which acquires said eccentric information on a disk from level of a truck zero cross signal after a party rate, and an edge.

[0019] In response to said track jump command, at least the above carries out adjustable [of the frequency response

characteristic of a phase compensating filter]. (Means 4) A hold signal generating circuit which holds a control signal to said truck actuator, It has a sample circuit which samples a value of a truck error signal produced by holding an optical pickup with a fixed time interval. An optical disk unit of means 1 publication including said eccentric detecting circuit which computes a condition of eccentricity from variation and sampling time of a truck error signal by which the sample was carried out, and outputs said eccentric information.

[0020] (Means 5) Were set based on said jump direction, said number information of jump trucks, and spindle rotation period information. It has a storage means to memorize range data of magnitude of eccentric acceleration and range data of the eccentric direction suitable for a track jump as a window. An optical disk unit of means [which is characterized by including said track jump enable signal generating circuit which generates a track jump enable signal when said eccentric acceleration which said eccentric detecting circuit outputs, and said eccentric direction enter in a predetermined window] 1, or means 3 publication.

[0021] A truck error signal generating circuit which generates a truck error signal, (Means 6) In a drive method of an optical disk of having a means to drive an actuator so that said truck error signal may be set to 0 based on an output of a phase compensating filter and this filter to the extent that phase compensation of this truck error signal is carried out In response to a command which jumps a truck, based on a truck error signal, detect sense and acceleration of eccentricity of a disk, and this eccentric information is outputted. A track jump enable signal which shows track jump initiation timing based on this eccentric information, the direction of a track jump, and a current disk rotation period is generated. A drive method of an optical disk characterized by receiving this track jump enable signal and generating a jump signal which carries out movable of said actuator].

[0022]

[Function] The optical disk unit of means 1 and means 2 publication raises the stability of a track jump, and certainty by performing a track jump only after it takes in the truck error signal in front of a jump in the eccentric detection section first, and it observes the condition (acceleration and direction) of eccentricity, and waiting until it becomes in the eccentric speed magnitude and direction which become settled from the direction of a track jump make into the purpose, the number of jumps, and a current spindle rotational frequency and which are consider to are the optimal.

[0023] Moreover, if it is the track jump device of the disk unit by the optical method, and the range and direction of the optimal eccentric acceleration over the direction of a track jump, the number of jump trucks, and a spindle rotational frequency are beforehand set as the storage means (for example, thing as shown in a table), the certainty of a track jump can be increased in the optical disk unit of various methods.

[0024] Especially invention of means 1 publication has the track jump enabling circuit which generates the timing for performing a track jump from the information on the eccentric acceleration detected as the eccentric detecting circuit which detects the acceleration of disk eccentricity and the jump direction, the number of jumps, and a spindle rotational frequency from the truck error signal used by the tracking servo of an optical disk. This eccentric detecting circuit detects the magnitude and the direction of eccentric acceleration from a truck error signal, and outputs them to the track jump enabling circuit of the next step. A track jump enabling circuit outputs a jump enable signal so that it may jump to the timing which becomes settled from eccentric acceleration and the number of jumps, the jump direction, and a spindle rotational frequency and which cannot be most easily influenced of eccentricity.

[0025] Next, the eccentric detecting circuit in the optical disk unit of means 3 publication generates lowering and a truck error signal for the gain of truck servo system intentionally just before a track jump. The party rate of the truck error signal is carried out to after an appropriate time on the level at the time of an on-truck, and a truck zero cross signal is generated. This truck zero cross signal shows whether it is in a disk inner circumference side to the truck which the laser spot of an optical pickup is tracing in the condition that lower gain and servo actuation is performed, or it is in a periphery side. Moreover, the edge from which level changes to 1 to 0, or 0-1 shows having crossed the truck which the laser spot of an optical pickup is tracing. That is, the sense of eccentric acceleration can be judged on the level of a truck zero cross signal, the point used as eccentric acceleration max is a midpoint of a truck zero cross edge, and the point used as the eccentric acceleration 0 serves as an edge of a truck zero cross signal.

[0026] The eccentric detecting circuit in the optical disk unit of means 4 publication is the gestalt of other operations of an eccentric detecting circuit. That is, at least a truck changes the property of a phase compensating filter so that an optical pickup may be held just before a track jump. A hold of an optical pickup outputs a truck error signal. A truck error signal is incorporated according to the sampling rate defined beforehand. When the truck error signal first incorporated at time of day t (n-1) is set to TE (n-1) and the truck error signal incorporated by time-of-day t (n) is set to TE (n), an eccentric speed is TV(n) ={TE(n)-TE (n-1)}/{t(n)-t (n-1)}. (3)

It comes out and asks.

[0027] When the truck error signal similarly incorporated at the next time of day t (n+1) is set to TE (n+1), an eccentric speed is TV(n+1) ={TE(n+1)-TE (n)}/{t(n+1)-t (n)}. (4)

It asks.

[0028] That is, it is TV=deltaTE/deltat when a sampling-time gap is set to regularity =deltat. (5)

Therefore, eccentric acceleration is proportional to the variation of an eccentric speed, and is deltaTV=TV(n+1)-TV (n). (6)

It is expressed with eccentric acceleration AC**delta TV.

[0029] As mentioned above, the sense of eccentric acceleration and the information on magnitude can be acquired by sampling a truck error signal with a fixed time interval.

[0030] Moreover, if the track jump command from a control means is received, the track jump enable signal generating circuit in the optical disk unit of means 5 publication will receive the output signal from the direction of a track jump, the number of track jumps, and a disk roll control circuit to a spindle motor, and will set up the window about the direction and size of eccentric acceleration in the case of permitting a jump according to the table defined beforehand. Furthermore the sense and magnitude of eccentric acceleration from an eccentric detecting circuit are inputted, and only when it enters in the window where the value was set up, a track jump enable signal is outputted. The driver which moves the actuator of an optical pickup outputs the drive signal of an optical pickup actuator only after it receives the signal of this enable signal, jump instruction, and the jump direction. If the predetermined number of jumps is jumped, the driven optical pickup will draw a truck servo again, and will end a jump sequence.
[0031] Furthermore, according to the drive method of the optical disk means 6 publication, a track jump can be carried out certainly.
[0032]
[Embodiment of the Invention] Hereafter, the application to CD-ROM is explained using drawing 2 , drawing 3 , and drawing 4 about the track jump method of the optical disk memory equipment which is the gestalt of operation of the first of this invention. In drawing 2 , 1 shows an optical disk, for example, CD-ROM, and 2 shows an optical pickup. First, when it explains from a data reversion system, 10 is an RF amplifier which amplifies the data signal of the minute amplitude which an optical pickup outputs for data processing, and 11 indicates the block which corrects the error of data to be the data slicer which makes binary the data which an RF amplifier outputs. 12 shows the interface which changes the output of a data slice error correction block into the data input output format for outputting to a host computer 13, and 13 shows a host computer. In order that 14 may read data by the constant linear velocity, the CLV servo block for changing the rotational frequency of a spindle motor on the inner circumference and the periphery of a disk is shown, and C4 shows the revolving-speed-control signal to a spindle motor.
[0033] Next, a control system is explained. The amplifier (henceforth amplifier) which generates the truck error signal showing the error of which 3 has from the truck which calculates the reflective signal from an optical pickup and the laser spot is tracing is shown. Here, when a truck error signal is set to 0 for convenience when [of explanation] an optical pickup occurs on a truck, the optical pickup has shifted to disk inner circumference from the truck currently traced and it has shifted to negative and a periphery, the truck error signal S1 used as positive shall be generated. The reflective signal of a disk is calculated and the laser spot of an optical pickup serves as a truck error signal generating circuit which generates the signal showing the error of which it has in the inner circumference or the direction of a periphery of a disk from the target truck. At least 4 is a phase compensating filter, and it calculates to a truck error signal so that a truck servo loop may serve as a desired transfer function. Based on this filter output, an actuator drive signal generating circuit drives an actuator through the pickup actuator driver 5 so that a truck error signal may be set to 0. 8 is an eccentric detecting circuit which detects eccentricity from the truck error signal S1, and the jump enable signal generation circuit of 9 generates reception and jump enable signal S4 for the eccentric information S3 and the jump direction C2 outputted from the control means which is not illustrated, C3 jumps, and the spindle roll control signal C4.
[0034] Next, the configuration of the eccentric detecting circuit 8 in the gestalt of the first operation and the jump enabling generation circuit 9 is explained using drawing 3 and drawing 4 . First, in the eccentric detecting circuit 8, 81 shows the low pass filter which removes a high-frequency component from the truck error signal S1. The truck error signal removed in the high-frequency component is the truck zero cross comparator of 82, a party rate is carried out on the truck error signal level of an on-truck, 0 [i.e.,], and the truck zero cross signal S31 is generated.
[0035] Before the jump command C1 is outputted from a control means, the optical pickup is tracing a certain truck on an optical disk. In this condition, the truck error signal S1 is in about 0 condition. In this condition, even if it passes a filter 81, it is thought that the zero cross of the truck error signal S1 is frequently carried out by a noise component etc.
[0036] Next, if the jump command signal C1 is outputted from a control means, at least a truck [in / in the gain down signal generating circuit 83 / drawing 2] will issue fixed period gain down command S2 to the phase compensating filter 4. At least a truck will reduce the low-pass gain of a filter to the value set up beforehand, if the phase compensating filter 4 receives this gain down command S2. As for the value of this gain, it is desirable to decide beforehand that a servo does not separate.
[0037] Since servo gain falls, a truck error oppression ratio falls, and the amplitude of the truck error signal S1 becomes large. Therefore, carrying out a zero cross of the truck error signal S86 after filter 81 passage frequently under the effect of a noise is lost. The output S31 of the truck zero cross comparator 82 is outputted in this condition as a binary signal which synchronized with the disk eccentricity period as shown in drawing 4 .
[0038] Next, the jump enable signal generation circuit 9 receives this truck zero cross signal S31, and judges the sense and the maximum point of eccentric acceleration. That is, when the truck zero cross signal S31 is 0 level, it is shown that an optical pickup is located in the inner circumference side of a disk to a truck, and when a truck zero cross signal is 1 level, it is shown that the optical pickup is located in a disk periphery side to a truck. Moreover, as shown in drawing 4 , the portion of the edge of the zero cross signal S31 shows that eccentric acceleration serves as zero. In the gestalt of the first operation, the magnitude of eccentric acceleration is not detected but extracts only the information on the max of acceleration, the minimum point, and the sense. The track jump enable signal generating circuit 9 of the gestalt of this operation receives reception, the jump direction C2 from a control means and C3 jump trucks, and the roll control signal C4 of the spindle motor from a CLV servo block for the zero cross signal S31 from the eccentric speed detecting circuit 8. This is a command signal to the driver of a spindle motor with a certain magnitude.

[0039] First, the jump direction setting signal C2 from a control means presupposes that it was what the jump direction orders the jump turned to a periphery from inner circumference.
[0040] In the gestalt of this operation, in order to eliminate the phenomenon of jump driving backward by eccentricity as much as possible, when eccentric acceleration is suitable inside, namely, when it is the jump direction and hard flow, it is good to perform a jump. From a formula (1) and a formula (2), since, as for the eccentric phase, i.e., the phase of a truck error signal, and the phase of eccentric acceleration, it turns out that it is shifted 180 degrees, a jump is performed in the positive portion of a truck zero cross signal. Although considered the rising edge neighborhood of a truck zero cross signal, since the suitable timing of jump initiation cannot predict the rising edge of a truck zero cross beforehand immediately after the jump instruction from a control means comes out, it waits for the following rising edge, or outputs jump enabling from a falling edge in a certain place which carried out time amount progress. That is, in this case, according to the data memorized by internal ROM93, the track jump enabling generating circuit 9 generates a window signal S94 so that jump enabling S4 may be generated from the standup of the truck zero cross S31, and falling in a certain place which carried out time delay progress. Although the example of CD-ROM was shown here, this window is suitably set up from the property of drive equipment, the property of an optical disk, etc.
[0041] Drawing 4 shows the timing of the signal in the gestalt of this operation. After waiting for a certain time delay set up to falling of the first truck zero cross S31 in the window setting circuit 92 after the jump command C1 is set to 1 level, jump rice Boolean S4 is outputted. When the standup of a truck zero cross is furthermore detected ahead of falling of a truck zero cross, the window is generated so that it may output jump enabling at the time. Thereby, the magnitude of the eccentric acceleration at the time of jump initiation can reduce to zero a possibility of being passed by eccentricity since the rate that eccentric acceleration becomes the jump direction and reverse becomes high, during near and a jump.
[0042] The actuator driver 5 generates the drive signal to which it carries out movable [of the actuator 6] in the place which received jump enable signal S4 according to the jump command from a control means, and a track jump is performed.
[0043] Next, the gestalt of operation of the 2nd of this invention is explained using drawing 2 , drawing 5 , and drawing 6 . In drawing 2 , 1 shows an optical disk like the gestalt of the first operation, and 2 shows an optical pickup. 10 is an RF amplifier which amplifies the data signal of the minute amplitude which an optical pickup outputs for data processing, and 11 indicates the block which corrects the error of data to be the data slicer which makes binary the data which an RF amplifier outputs. 12 shows the interface which changes the output of a data slice error correction block into the data input output format for outputting to a host computer, and 13 shows a host computer. In order that 14 may read data by the constant linear velocity, the CLV servo block for changing the rotational frequency of a spindle motor on the inner circumference and the periphery of a disk is shown, and C4 shows the revolving-speed-control signal to a spindle motor. Moreover, the generation amplifier of the truck error signal S1 showing the error of which 3 has from the truck which calculates the reflective signal from an optical pickup and the laser spot is tracing is shown. Here, when a truck error signal is set to 0 when the expedient up optical pickup of explanation occurs on a truck, the optical pickup has shifted to disk inner circumference from the truck currently traced and it has shifted to negative and a periphery, the truck error signal S1 used as positive shall be generated. At least 4 is a phase compensating filter, 5 shows a pickup actuator driver and 6 shows a pickup actuator.
[0044] 8 is an eccentric detecting circuit which detects eccentricity from the truck error signal S1, and the jump enable signal generation circuit of 9 generates a reception jump enable signal for the eccentric information S3 and the jump direction C2, C3 jumps, and the spindle roll control signal C4.
[0045] Next, with drawing 5 and drawing 6 , are and the eccentric detecting circuit 8 and the jump enabling generation circuit 9 in the gestalt of operation of the second of this invention are explained.
[0046] In the condition that a truck servo starts first and the optical pickup follows the truck, it is hard to say that it expresses the acceleration of eccentricity under the effect of a high region noise even if the variation in the minute time interval of the truck error signal S1 lets a filter pass. Then, if the jump command signal C1 is outputted from a control means, the hold signal generating circuit 84 will output a hold signal S2 at least for a truck to the phase compensating filter 4. If a hold signal S2 is received, at least a truck will change the phase compensating filter 4 into the property that a low-pass property, i.e., the high-frequency component of an input signal, is omitted, and the property cannot be followed at a steep change.
[0047] Consequently, since flattery actuation of an optical pickup is held to truck eccentricity, the eccentricity itself comes to appear in the truck error signal S1.
[0048] The eccentric acceleration calculation circuit 85 samples the filtered truck error signal S86 by fixed time interval deltat, and computes eccentric acceleration. That is, as shown in drawing 6 , the truck error signal S1 is held to every fixed time interval deltat, the operation of eccentric speed V=deltaTE/deltat and acceleration =delta V/delta t is performed, and the magnitude and the direction of acceleration are searched for.
[0049] If it explains taking the case of drawing 5 , the value of the truck error which sampled the truck error signal S1 outputted by the pickup hold at intervals of deltat will presuppose that they were TE (n-1), TE (n), and TE (n+1), respectively. An eccentric speed in each sampling time is TV(n) =TE(n)-TE (n-1). (7)
TV(n+1)=TE(n+1)-TE(n) (8)
It is expressed.
[0050] Moreover, since it is expressed with the variation of an eccentric speed, acceleration is acceleration =deltaTV=TV(n+1)-TV (n). (9)
It becomes.
[0051] The sign of deltaTV shows the direction of acceleration. Since it is TV(n) >TV (n+1) in the example of drawing 6 ,

deltaTV serves as negative and it turns out that acceleration is going in the direction of inner circumference from the periphery of a disk. Moreover, the magnitude of eccentric acceleration is called for by |TV(n+1)-TV(n) |. Thus, eccentric acceleration is computed from a truck error signal, and the eccentric acceleration direction signal shown by S32 of drawing 5 and the amount signal of eccentric acceleration shown by S33 of drawing 5 are outputted to the jump enabling generation circuit 9.

[0052] Next, the jump enable signal generating circuit 9 detects the spindle roll control signal C3 from a spindle control section to the jump direction C2 from a control means and C3 jumps, and a pan, and sets the window for enable signal S4 as them.

[0053] In the gestalt of this operation, if it is jumping a track jump from inner circumference to the sense of a periphery, in order to eliminate the possibility of driving backward on the pickup jump direction by eccentricity as much as possible, it is appropriate to perform a jump to timing with the eccentric acceleration near 0. Moreover, by starting a jump from before a certain degree from which eccentric acceleration becomes the jump direction and reverse, after eccentric acceleration becomes the jump direction and reverse, a window which starts a jump in the large range can be set up rather than it begins a jump. Using the above ways of considering, the jump enable signal generating circuit 9 determines the sense of the eccentric acceleration which permits a track jump according to the contents of the table ROM shown in 93 of drawing 5 from the control signal C4 of the jump direction C2, C3 jumps, and a spindle motor, and the range of magnitude, and sets them up as a window as shown in drawing 6 . If the value of the signal S33 which shows the direction signal S32 of the eccentric acceleration from an eccentric detecting circuit and the magnitude of acceleration enters in this window, track jump enable signal S4 will be generated.

[0054] The actuator driver 5 generates the drive signal to which it carries out movable [of the actuator 6] in the place which received jump enable signal S4 according to the jump command from a control means, the pickup actuator 6 is kicked, and a track jump is performed.

[0055]

[Effect of the Invention] As explained above, in order that the track jump device of the optical disk memory equipment by this invention may perform a track jump to the optimal timing by carrying out the monitor of the condition of disk eccentricity, it eliminates the bad influence of the track jump under the effect of eccentricity as much as possible, and performs stability and a positive track jump, and its establishment which an optical pickup reaches to the target truck improves. That is, the access time for accessing to the target data is shortened, and a readout or write-in actuation is accelerated. It is thought that the track jump method of this invention has the effect that it is big when the frequency of short-distance random access is high, in the drive of a high-speed rotational frequency especially with the large and eccentricity of media.

[Translation done.]

TECHNICAL FIELD

[A technical field to which invention belongs] About a random access method of optical disk memory equipment, this invention eliminates effect of a tracking servo device, especially disk eccentricity at the time of jump initiation as much as possible, and relates to a method of making an optical pickup jumping to stability and the target truck certainly.

[Translation done.]

PRIOR ART

[Description of the Prior Art] The track jump method of conventional optical disk memory equipment is explained using drawing 1 and drawing 7 . Drawing 1 shows the outline configuration of a drive of CD-ROM which is optical disk memory equipment only for playbacks. 1 is an optical disk, and as a list of the pit where minute length is different, from disk inner circumference, digital information is missing from a periphery and is spirally recorded on this disk, an optical pickup 2 amplifies the reflected light from the disk of laser diode with a photodiode, amplifies reception and it with amplifier, and it is reproducing data. RF amplifier 10 amplifies the output of the photodiode of an optical pickup, and passes it to a data slice and the error correction block 11. CD-ROM is performing rotational-speed control called the CLV servo which keeps the linear velocity of a disk constant, in order to read data to the inner circumference of a disk, and a periphery with ****** and a fixed data rate. The CLV servo 14 outputs the signal C4 which controls a spindle motor so that reception and the data period read become fixed about the signal from a data slice and an error correction block to a spindle motor. The data after an error correction goes into the interface block 12 with a host with a data slice and an error correction block, and data is outputted to a host computer 13 according to a specific format.
[0003] However, as an error on a disk and manufacture of a drive, in CD-ROM, there is no axis of rotation of a disk strictly centering on a disk, and it has in it the eccentricity below the value which becomes settled by specification. Although fine cut in the shape of a spiral toward the periphery from the most inner circumference in fact, since distance with the next truck is very detailed, they are explained that the data tracks minced on the disk have the shape of a concentric circle centering on the axis of rotation in approximation. It sees from an optical pickup, and the truck will be observed [when the data tracks of a certain arbitration were observed with the view which stood it still to the earth and a disk rotates at high speed] as it is vibrating the rotation period to radial, without being visible with one stationary line, as shown in drawing 7 , since the axis of rotation has eccentricity.
[0004] In CD-ROM, a disk radial truck gap is 1.6 micrometers, and since the maximum eccentricity defined by specification is **70 micrometers or less, the truck of ten numbers per rotation will cross an optical pickup by the eccentric component. So, in order to reproduce data, rotating a disk and tracing one truck, the truck servo for making an optical pickup follow the target truck is needed.
[0005] The amplifier of 3 generates S1 for the truck error signal which shows the error of which the reflected light of a disk is calculated and a laser spot has from the target truck, and inputs at least that of 4 into a phase compensating filter. Since the transfer characteristics of the actuator 6 to which it carries out movable [of the optical pickup] are behind [180 degrees] in the phase in the point that a loop gain is set to 0dB, the way things stand, a system is not stabilized by them. Then, at least that of 4 advances the phase in the frequency from which gain is set to 0dB with a phase compensating filter, and is maintaining the system at stability. Moreover, the role which raises the loop gain of a band which wants to oppress a truck error signal is also played. The actuator driver of 5 generates the drive signal S5 for carrying out movable [of the actuator 6 of reception and an optical pickup] for the output of the phase compensating filter 4.
[0006] With the drive signal S5, an actuator 6 carries out movable to radial [of a disk] so that a truck error signal may be oppressed, and it performs actuation which is always followed to the target truck by continuing the above actuation.
[0007] In this CD-ROM equipment, in order to access the target data, the device which jumps a truck is established by moving an optical pickup to the disk radial by the command from a control means (not shown). Generally, although the actuator which carries out movable [of the optical pickup] to the disk radial in CD-ROM equipment has two lines of the rough actuator (the movable range of about 30mm) which slides an optical pickup to the disk radial in order to reproduce the data currently spirally recorded as the energy actuator (about 100 micrometers of movable range of numbers) for following eccentricity, especially by explanation of this invention, it is not distinguished but only let it be an actuator.
[0008] Generally a track jump is performed by the following actuation. Truck servo actuation is temporarily interrupted by the track jump command from a control means, and an actuator driver generates the kick signal which moves the actuator of an optical pickup in disk inner circumference or the direction of a periphery. If an actuator operates and an optical pickup begins to move to the disk radial, counting of the number of trucks crossed from the wave of the truck error signal under pickup migration and a data signal will be carried out. If it judges that it reached to the target truck from the number of trucks by which counting was carried out, truck servo actuation will be resumed and reading of data will be begun.

[Translation done.]

* NOTICES *

EFFECT OF THE INVENTION

[Effect of the Invention] As explained above, in order that the track jump device of the optical disk memory equipment by this invention may perform a track jump to the optimal timing by carrying out the monitor of the condition of disk eccentricity, it eliminates the bad influence of the track jump under the effect of eccentricity as much as possible, and performs stability and a positive track jump, and its establishment which an optical pickup reaches to the target truck improves. That is, the access time for accessing to the target data is shortened, and a readout or write-in actuation is accelerated. It is thought that the track jump method of this invention has the effect that it is big when the frequency of short-distance random access is high, in the drive of a high-speed rotational frequency especially with the large and eccentricity of media.

[Translation done.]

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, by the method of the conventional track jump, since the direction of the truck horizontal end speed by disk eccentricity became large depending on [passing speed / of an optical pickup] the timing of track jump initiation to increase of the disk eccentricity accompanying improvement in the speed of disk rotational speed, with the direction to carry out an appearance top track jump, the optical pickup may have moved to reverse and the phenomenon which does not reach to the target truck may have arisen. In this case, disk data must be read again, a jump must be redone and the problem that arriving at the target truck as a result will take time amount is produced.
[0010] The rotational speed of a disk is also accelerated with the twice of digital audio playback, 4 times, and 8 times as CD will accomplish evolution from digital audio playback to the use as data-logging media for multimedia in recent years, if CD (compact disk) is taken for an example. Since rotational-speed control called the CLV servo which keeps the linear velocity of a disk constant in order that CD may read data to the inner circumference of a disk and a periphery with ****** and a fixed data rate is performed, when the optical pickup is tracing the truck near the most inner circumference of a disk, the rotational speed of a disk becomes a high speed most. Although the maximum eccentricity is not dependent [the angular velocity of disk rotation], and fixed when reproducing data by one 8 times the data transfer rate of this to the data transfer rate for the usual digital audios, it depends for the maximum eccentricity acceleration on rotational angular frequency. That is, eccentricity and eccentric acceleration are expressed with the following formulas. xo shows the maximum eccentricity displacement.
[0011]
Displacement X=xo-sinomegat (1)
Eccentric acceleration d2 x/dt2=-xo-omega 2sinomegat=-omega2x (2)
a top type -- eccentricity -- it turns out that the relation between displacement and change-of-mind acceleration serves as a sine wave from which a phase differs 180 degrees. When 140 micrometers and disk linear velocity at the time of the usual digital audio playback are carried out for the maximum eccentricity in 1.4m/s here, the angle-of-rotation frequency in the disk most inner circumference is as follows.
[0012] omega=2pif= linear velocity / most-inner-circumference radius = depending 1.4/0.025=56, the maximum eccentricity acceleration serves as d2 x/dt2=562 and 140e-6=0.44 m/s2.
[0013] Moreover, supposing it reads data by one 8 times the linear velocity of this, similarly, by the most inner circumference of a disk, it is set to omega=2pif=11.2/0.025=448 maximum eccentricity acceleration =4482 and 140e-6=28.1m/s2, and will have 8x8=64 time [of the very usual digital audio] eccentric acceleration.
[0014].Thus, if rotational speed of a disk is made high in order to raise a data transfer rate, in connection with it, eccentric acceleration will become large by the square. For this reason, the phenomenon which an optical pickup moves to eccentric acceleration, the sense to perform a track jump depending on the timing at the time of jump initiation, and the reverse sense may occur. Moreover, at the time of truck servo drawing in at the time of jump convergence, since a disk radial relative velocity of an optical pickup and a truck is too large, a possibility that a servo cannot be drawn is also produced.
[0015] From the background mentioned above, by this invention, the effect of the eccentricity of the optical disk in the conventional track jump method is eliminated as much as possible, and how to perform a stable track jump is stated.

[Translation done.]

MEANS

[Means for Solving the Problem] In order to solve the above-mentioned technical problem, an optical disk unit and an optical disk drive method of this invention A truck error signal generating circuit which generates a truck error signal, (Means 1) In an optical disk unit which has a means to drive an actuator so that said truck error signal may be set to 0 based on an output of a phase compensating filter and this filter to the extent that phase compensation of this truck error signal is carried out An eccentric detection means to detect sense and acceleration of eccentricity of a disk based on a truck error signal, and to output this eccentric information in response to a command which jumps a truck, A track jump enable signal generating means to generate a track jump enable signal which shows track jump initiation timing based on this eccentric information, the direction of a track jump, and a current disk rotation period, An optical disk unit characterized by receiving this track jump enable signal and having a jump signal generating circuit which generates a jump signal which carries out movable [of said actuator].
[0017] (Means 2) Said jump command is the optical disk unit of means 1 publication characterized by generating a track jump enable signal which shows said track jump initiation timing based on this count information of a jump including count information of a jump.
[0018] A truck zero cross comparator which carries out the party rate of said truck error signal with signal level in case the beam spot of an optical pickup is on a truck, and generates a binary-ized signal, (Means 3) It has a gain down signal generating circuit at least for the above to lower gain of a servo band of a phase compensating filter, and enlarge amplitude of this truck error signal in response to said track jump command. By gain down, with this truck zero cross comparator, carry out the party rate of the truck error signal to which amplitude became large, and it is made binary. An optical disk unit of means 1 publication characterized by having said eccentric detecting circuit which acquires said eccentric information on a disk from level of a truck zero cross signal after a party rate, and an edge.
[0019] In response to said track jump command, at least the above carries out adjustable [of the frequency response characteristic of a phase compensating filter]. (Means 4) A hold signal generating circuit which holds a control signal to said truck actuator, It has a sample circuit which samples a value of a truck error signal produced by holding an optical pickup with a fixed time interval. An optical disk unit of means 1 publication including said eccentric detecting circuit which computes a condition of eccentricity from variation and sampling time of a truck error signal by which the sample was carried out, and outputs said eccentric information.
[0020] (Means 5) Were set based on said jump direction, said number information of jump trucks, and spindle rotation period information. It has a storage means to memorize range data of magnitude of eccentric acceleration and range data of the eccentric direction suitable for a track jump as a window. An optical disk unit of means [which is characterized by including said track jump enable signal generating circuit which generates a track jump enable signal when said eccentric acceleration which said eccentric detecting circuit outputs, and said eccentric direction enter in a predetermined window] 1, or means 3 publication.
[0021] A truck error signal generating circuit which generates a truck error signal, (Means 6) In a drive method of an optical disk of having a means to drive an actuator so that said truck error signal may be set to 0 based on an output of a phase compensating filter and this filter to the extent that phase compensation of this truck error signal is carried out In response to a command which jumps a truck, based on a truck error signal, detect sense and acceleration of eccentricity of a disk, and this eccentric information is outputted. A track jump enable signal which shows track jump initiation timing based on this eccentric information, the direction of a track jump, and a current disk rotation period is generated. A drive method of an optical disk characterized by receiving this track jump enable signal and generating a jump signal which carries out movable of said actuator].

[Translation done.]

OPERATION

[Function] The optical disk unit of means 1 and means 2 publication raises the stability of a track jump, and certainty by performing a track jump only after it takes in the truck error signal in front of a jump in the eccentric detection section first, and it observes the condition (acceleration and direction) of eccentricity, and waiting until it becomes in the eccentric speed magnitude and direction which become settled from the direction of a track jump make into the purpose, the number of jumps, and a current spindle rotational frequency and which are consider to are the optimal.
[0023] Moreover, if it is the track jump device of the disk unit by the optical method, and the range and direction of the optimal eccentric acceleration over the direction of a track jump, the number of jump trucks, and a spindle rotational frequency are beforehand set as the storage means (for example, thing as shown in a table), the certainty of a track jump can be increased in the optical disk unit of various methods.
[0024] Especially invention of means 1 publication has the track jump enabling circuit which generates the timing for performing a track jump from the information on the eccentric acceleration detected as the eccentric detecting circuit which detects the acceleration of disk eccentricity and the jump direction, the number of jumps, and a spindle rotational frequency from the truck error signal used by the tracking servo of an optical disk. This eccentric detecting circuit detects the magnitude and the direction of eccentric acceleration from a truck error signal, and outputs them to the track jump enabling circuit of the next step. A track jump enabling circuit outputs a jump enable signal so that it may jump to the timing which becomes settled from eccentric acceleration and the number of jumps, the jump direction, and a spindle rotational frequency and which cannot be most easily influenced of eccentricity.
[0025] Next, the eccentric detecting circuit in the optical disk unit of means 3 publication generates lowering and a truck error signal for the gain of truck servo system intentionally just before a track jump. The party rate of the truck error signal is carried out to after an appropriate time on the level at the time of an on-truck, and a truck zero cross signal is generated. This truck zero cross signal shows whether it is in a disk inner circumference side to the truck which the laser spot of an optical pickup is tracing in the condition that lower gain and servo actuation is performed, or it is in a periphery side. Moreover, the edge from which level changes to 1 to 0, or 0-1 shows having crossed the truck which the laser spot of an optical pickup is tracing. That is, the sense of eccentric acceleration can be judged on the level of a truck zero cross signal, the point used as eccentric acceleration max is a midpoint of a truck zero cross edge, and the point used as the eccentric acceleration 0 serves as an edge of a truck zero cross signal.
[0026] The eccentric detecting circuit in the optical disk unit of means 4 publication is the gestalt of other operations of an eccentric detecting circuit. That is, at least a truck changes the property of a phase compensating filter so that an optical pickup may be held just before a track jump. A hold of an optical pickup outputs a truck error signal. A truck error signal is incorporated according to the sampling rate defined beforehand. When the truck error signal first incorporated at time of day t (n-1) is set to TE (n-1) and the truck error signal incorporated by time-of-day t (n) is set to TE (n), an eccentric speed is TV(n) ={TE(n)-TE (n-1)}/{t(n)-t (n-1)}. (3)
It comes out and asks.
[0027] When the truck error signal similarly incorporated at the next time of day t (n+1) is set to TE (n+1), an eccentric speed is TV(n+1) ={TE(n+1)-TE (n)}/{t(n+1)-t (n)}. (4)
It asks.
[0028] That is, it is TV=deltaTE/deltat when a sampling-time gap is set to regularity =deltat. (5)
Therefore, eccentric acceleration is proportional to the variation of an eccentric speed, and is deltaTV=TV(n+1)-TV (n). (6)
It is expressed with eccentric acceleration AC**delta TV.
[0029] As mentioned above, the sense of eccentric acceleration and the information on magnitude can be acquired by sampling a truck error signal with a fixed time interval.
[0030] Moreover, if the track jump command from a control means is received, the track jump enable signal generating circuit in the optical disk unit of means 5 publication will receive the output signal from the direction of a track jump, the number of track jumps, and a disk roll control circuit to a spindle motor, and will set up the window about the direction and size of eccentric acceleration in the case of permitting a jump according to the table defined beforehand. Furthermore the sense and magnitude of eccentric acceleration from an eccentric detecting circuit are inputted, and only when it enters in the window where the value was set up, a track jump enable signal is outputted. The driver which moves the actuator of an optical pickup outputs the drive signal of an optical pickup actuator only after it receives the signal of this enable signal, jump instruction, and the jump direction. If the predetermined number of jumps is jumped, the driven optical pickup will draw a truck servo

again, and will end a jump sequence.
[0031] Furthermore, according to the drive method of the optical disk means 6 publication, a track jump can be carried out certainly.
[0032]
[Embodiment of the Invention] Hereafter, the application to CD-ROM is explained using drawing 2 , drawing 3 , and drawing 4 about the track jump method of the optical disk memory equipment which is the gestalt of operation of the first of this invention. In drawing 2 , 1 shows an optical disk, for example, CD-ROM, and 2 shows an optical pickup. First, when it explains from a data reversion system, 10 is an RF amplifier which amplifies the data signal of the minute amplitude which an optical pickup outputs for data processing, and 11 indicates the block which corrects the error of data to be the data slicer which makes binary the data which an RF amplifier outputs. 12 shows the interface which changes the output of a data slice error correction block into the data input output format for outputting to a host computer 13, and 13 shows a host computer. In order that 14 may read data by the constant linear velocity, the CLV servo block for changing the rotational frequency of a spindle motor on the inner circumference and the periphery of a disk is shown, and C4 shows the revolving-speed-control signal to a spindle motor.
[0033] Next, a control system is explained. The amplifier (henceforth amplifier) which generates the truck error signal showing the error of which 3 has from the truck which calculates the reflective signal from an optical pickup and the laser spot is tracing is shown. Here, when a truck error signal is set to 0 for convenience when [of explanation] an optical pickup occurs on a truck, the optical pickup has shifted to disk inner circumference from the truck currently traced and it has shifted to negative and a periphery, the truck error signal S1 used as positive shall be generated. The reflective signal of a disk is calculated and the laser spot of an optical pickup serves as a truck error signal generating circuit which generates the signal showing the error of which it has in the inner circumference or the direction of a periphery of a disk from the target truck. At least 4 is a phase compensating filter, and it calculates to a truck error signal so that a truck servo loop may serve as a desired transfer function. Based on this filter output, an actuator drive signal generating circuit drives an actuator through the pickup actuator driver 5 so that a truck error signal may be set to 0. 8 is an eccentric detecting circuit which detects eccentricity from the truck error signal S1, and the jump enable signal generation circuit of 9 generates reception and jump enable signal S4 for the eccentric information S3 and the jump direction C2 outputted from the control means which is not illustrated, C3 jumps, and the spindle roll control signal C4.
[0034] Next, the configuration of the eccentric detecting circuit 8 in the gestalt of the first operation and the jump enabling generation circuit 9 is explained using drawing 3 and drawing 4 . First, in the eccentric detecting circuit 8, 81 shows the low pass filter which removes a high-frequency component from the truck error signal S1. The truck error signal removed in the high-frequency component is the truck zero cross comparator of 82, a party rate is carried out on the truck error signal level of an on-truck, 0 [i.e.,], and the truck zero cross signal S31 is generated.
[0035] Before the jump command C1 is outputted from a control means, the optical pickup is tracing a certain truck on an optical disk. In this condition, the truck error signal S1 is in about 0 condition. In this condition, even if it passes a filter 81, it is thought that the zero cross of the truck error signal S1 is frequently carried out by a noise component etc.
[0036] Next, if the jump command signal C1 is outputted from a control means, at least a truck [in / in the gain down signal generating circuit 83 / drawing 2] will issue fixed period gain down command S2 to the phase compensating filter 4. At least a truck will reduce the low-pass gain of a filter to the value set up beforehand, if the phase compensating filter 4 receives this gain down command S2. As for the value of this gain, it is desirable to decide beforehand that a servo does not separate.
[0037] Since servo gain falls, a truck error oppression ratio falls, and the amplitude of the truck error signal S1 becomes large. Therefore, carrying out a zero cross of the truck error signal S86 after filter 81 passage frequently under the effect of a noise is lost. The output S31 of the truck zero cross comparator 82 is outputted in this condition as a binary signal which synchronized with the disk eccentricity period as shown in drawing 4 .
[0038] Next, the jump enable signal generation circuit 9 receives this truck zero cross signal S31, and judges the sense and the maximum point of eccentric acceleration. That is, when the truck zero cross signal S31 is 0 level, it is shown that an optical pickup is located in the inner circumference side of a disk to a truck, and when a truck zero cross signal is 1 level, it is shown that the optical pickup is located in a disk periphery side to a truck. Moreover, as shown in drawing 4 , the portion of the edge of the zero cross signal S31 shows that eccentric acceleration serves as zero. In the gestalt of the first operation, the magnitude of eccentric acceleration is not detected but extracts only the information on the max of acceleration, the minimum point, and the sense. The track jump enable signal generating circuit 9 of the gestalt of this operation receives reception, the jump direction C2 from a control means and C3 jump trucks, and the roll control signal C4 of the spindle motor from a CLV servo block for the zero cross signal S31 from the eccentric speed detecting circuit 8. This is a command signal to the driver of a spindle motor with a certain magnitude.
[0039] First, the jump direction setting signal C2 from a control means presupposes that it was what the jump direction orders the jump turned to a periphery from inner circumference.
[0040] In the gestalt of this operation, in order to eliminate the phenomenon of jump driving backward by eccentricity as much as possible, when eccentric acceleration is suitable inside, namely, when it is the jump direction and hard flow, it is good to perform a jump. From a formula (1) and a formula (2), since, as for the eccentric phase, i.e., the phase of a truck error signal, and the phase of eccentric acceleration, it turns out that it is shifted 180 degrees, a jump is performed in the positive portion of a truck zero cross signal. Although considered the rising edge neighborhood of a truck zero cross signal, since the suitable timing of jump initiation cannot predict the rising edge of a truck zero cross beforehand immediately after the jump

instruction from a control means comes out, it waits for the following rising edge, or outputs jump enabling from a falling edge in a certain place which carried out time amount progress. That is, in this case, according to the data memorized by internal ROM93, the track jump enabling generating circuit 9 generates a window signal S94 so that jump enabling S4 may be generated from the standup of the truck zero cross S31, and falling in a certain place which carried out time delay progress. Although the example of CD-ROM was shown here, this window is suitably set up from the property of drive equipment, the property of an optical disk, etc.

[0041] Drawing 4 shows the timing of the signal in the gestalt of this operation. After waiting for a certain time delay set up to falling of the first truck zero cross S31 in the window setting circuit 92 after the jump command C1 is set to 1 level, jump rice Boolean S4 is outputted. When the standup of a truck zero cross is furthermore detected ahead of falling of a truck zero cross, the window is generated so that it may output jump enabling at the time. Thereby, the magnitude of the eccentric acceleration at the time of jump initiation can reduce to zero a possibility of being passed by eccentricity since the rate that eccentric acceleration becomes the jump direction and reverse becomes high, during near and a jump.

[0042] The actuator driver 5 generates the drive signal to which it carries out movable [of the actuator 6] in the place which received jump enable signal S4 according to the jump command from a control means, and a track jump is performed.

[0043] Next, the gestalt of operation of the 2nd of this invention is explained using drawing 2 , drawing 5 , and drawing 6 . In drawing 2 , 1 shows an optical disk like the gestalt of the first operation, and 2 shows an optical pickup. 10 is an RF amplifier which amplifies the data signal of the minute amplitude which an optical pickup outputs for data processing, and 11 indicates the block which corrects the error of data to be the data slicer which makes binary the data which an RF amplifier outputs. 12 shows the interface which changes the output of a data slice error correction block into the data input output format for outputting to a host computer, and 13 shows a host computer. In order that 14 may read data by the constant linear velocity, the CLV servo block for changing the rotational frequency of a spindle motor on the inner circumference and the periphery of a disk is shown, and C4 shows the revolving-speed-control signal to a spindle motor. Moreover, the generation amplifier of the truck error signal S1 showing the error of which 3 has from the truck which calculates the reflective signal from an optical pickup and the laser spot is tracing is shown. Here, when a truck error signal is set to 0 when the expedient up optical pickup of explanation occurs on a truck, the optical pickup has shifted to disk inner circumference from the truck currently traced and it has shifted to negative and a periphery, the truck error signal S1 used as positive shall be generated. At least 4 is a phase compensating filter, 5 shows a pickup actuator driver and 6 shows a pickup actuator.

[0044] 8 is an eccentric detecting circuit which detects eccentricity from the truck error signal S1, and the jump enable signal generation circuit of 9 generates a reception jump enable signal for the eccentric information S3 and the jump direction C2, C3 jumps, and the spindle roll control signal C4.

[0045] Next, with drawing 5 and drawing 6 , are and the eccentric detecting circuit 8 and the jump enabling generation circuit 9 in the gestalt of operation of the second of this invention are explained.

[0046] In the condition that a truck servo starts first and the optical pickup follows the truck, it is hard to say that it expresses the acceleration of eccentricity under the effect of a high region noise even if the variation in the minute time interval of the truck error signal S1 lets a filter pass. Then, if the jump command signal C1 is outputted from a control means, the hold signal generating circuit 84 will output a hold signal S2 at least for a truck to the phase compensating filter 4. If a hold signal S2 is received, at least a truck will change the phase compensating filter 4 into the property that a low-pass property, i.e., the high-frequency component of an input signal, is omitted, and the property cannot be followed at a steep change.

[0047] Consequently, since flattery actuation of an optical pickup is held to truck eccentricity, the eccentricity itself comes to appear in the truck error signal S1.

[0048] The eccentric acceleration calculation circuit 85 samples the filtered truck error signal S86 by fixed time interval deltat, and computes eccentric acceleration. That is, as shown in drawing 6 , the truck error signal S1 is held to every fixed time interval deltat, the operation of eccentric speed V=deltaTE/deltat and acceleration =delta V/delta t is performed, and the magnitude and the direction of acceleration are searched for.

[0049] If it explains taking the case of drawing 5 , the value of the truck error which sampled the truck error signal S1 outputted by the pickup hold at intervals of deltat will presuppose that they were TE (n-1), TE (n), and TE (n+1), respectively. An eccentric speed in each sampling time is TV(n) =TE(n)-TE (n-1). (7)

TV(n+1)=TE(n+1)-TE(n) (8)

It is expressed.

[0050] Moreover, since it is expressed with the variation of an eccentric speed, acceleration is acceleration =deltaTV=TV(n+1)-TV (n). (9)

It becomes.

[0051] The sign of deltaTV shows the direction of acceleration. Since it is TV(n) >TV (n+1) in the example of drawing 6 , deltaTV serves as negative and it turns out that acceleration is going in the direction of inner circumference from the periphery of a disk. Moreover, the magnitude of eccentric acceleration is called for by |TV(n+1)-TV(n) |. Thus, eccentric acceleration is computed from a truck error signal, and the eccentric acceleration direction signal shown by S32 of drawing 5 and the amount signal of eccentric acceleration shown by S33 of drawing 5 are outputted to the jump enabling generation circuit 9.

[0052] Next, the jump enable signal generating circuit 9 detects the spindle roll control signal C3 from a spindle control section to the jump direction C2 from a control means and C3 jumps, and a pan, and sets the window for enable signal S4 as them.

[0053] In the gestalt of this operation, if it is jumping a track jump from inner circumference to the sense of a periphery, in order to eliminate the possibility of driving backward on the pickup jump direction by eccentricity as much as possible, it is appropriate to perform a jump to timing with the eccentric acceleration near 0. Moreover, by starting a jump from before a certain degree from which eccentric acceleration becomes the jump direction and reverse, after eccentric acceleration becomes the jump direction and reverse, a window which starts a jump in the large range can be set up rather than it begins a jump. Using the above ways of considering, the jump enable signal generating circuit 9 determines the sense of the eccentric acceleration which permits a track jump according to the contents of the table ROM shown in 93 of drawing 5 from the control signal C4 of the jump direction C2, C3 jumps, and a spindle motor, and the range of magnitude, and sets them up as a window as shown in drawing 6 . If the value of the signal S33 which shows the direction signal S32 of the eccentric acceleration from an eccentric detecting circuit and the magnitude of acceleration enters in this window, track jump enable signal S4 will be generated.
[0054] The actuator driver 5 generates the drive signal to which it carries out movable [of the actuator 6] in the place which received jump enable signal S4 according to the jump command from a control means, the pickup actuator 6 is kicked, and a track jump is performed.

[Translation done.]

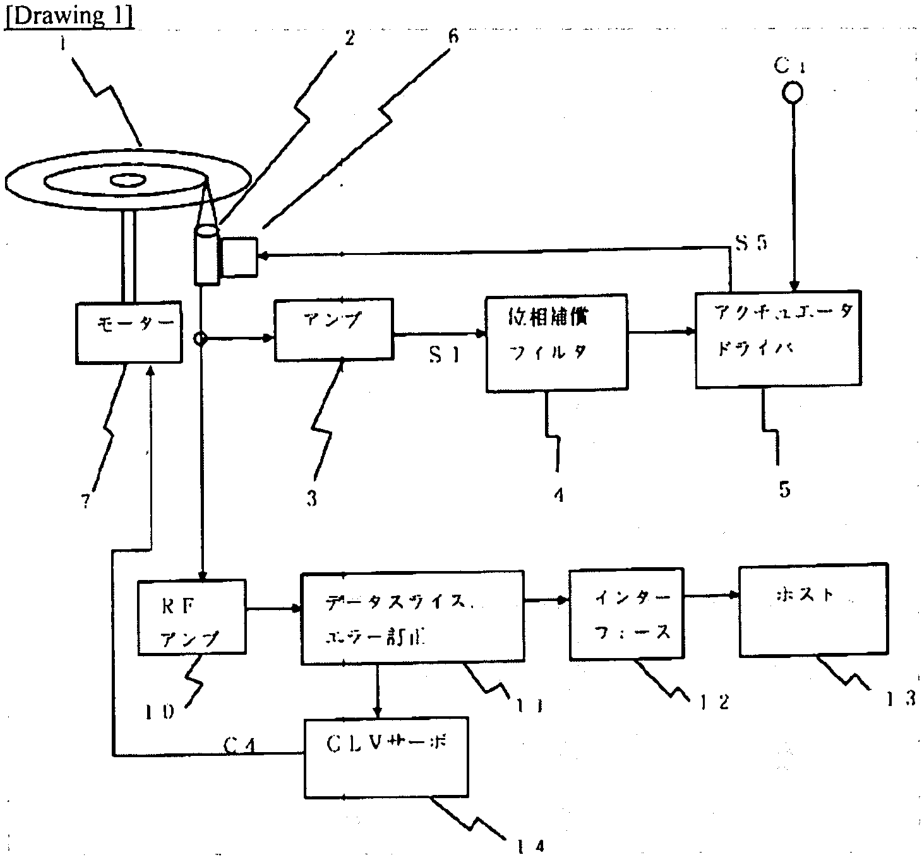
DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The block diagram of the truck control section of conventional optical disk memory equipment.
[Drawing 2] The block diagram of the truck control section of the optical disk memory equipment in this invention.
[Drawing 3] They are a **** eccentricity detecting circuit and an enable signal generating circuit block diagram to the gestalt of operation of the first of this invention.
[Drawing 4] It is a **** signal timing chart to the gestalt of operation of the first of this invention.
[Drawing 5] They are a **** eccentricity detecting circuit and an enable signal generating circuit block diagram to the gestalt of operation of the second of this invention.
[Drawing 6] It is **** truck error signal drawing to the gestalt of operation of the second of this invention.
[Drawing 7] The conceptual diagram of the eccentricity in an optical disk unit.
[Description of Notations]
1 Optical Disk Memory
2 Optical Pickup
3 Truck Error Amplifier
4 Phase Compensating Filter
5 Actuator Driver
S5 Drive signal
6 Pickup Actuator
7 Spindle Motor
8 Eccentric Detecting Circuit
81 Low Pass Filter
82 Truck Zero Cross Comparator
83 Gain Down Signal Generation Circuit
84 Hold Signal Generation Circuit
85 Eccentric Acceleration Calculation Circuit
S86 Truck error signal which a low pass filter 81 outputs
9 Jump Enabling Generation Circuit
91 Jump Enabling Judging Circuit
92 Window Setting Circuit
93 Read Only Memory
S94 Window signal
10 RF Amplifier
11 Data Slice and Error Correction
12 Interface
13 Host Computer
14 CLV Servo
S1 Truck error signal
S2 A phase compensating filter gain rise or hold signal
S3 Eccentric acceleration signal
S31 Truck zero cross signal (eccentric acceleration phasing signal)
S32 The eccentric acceleration direction signal
S33 The amount signal of eccentric acceleration
S4 Track jump enable signal
C1 Jump command signal
C2 The jump direction signal
C3 The number signal of jumps
C4 Spindle control signal

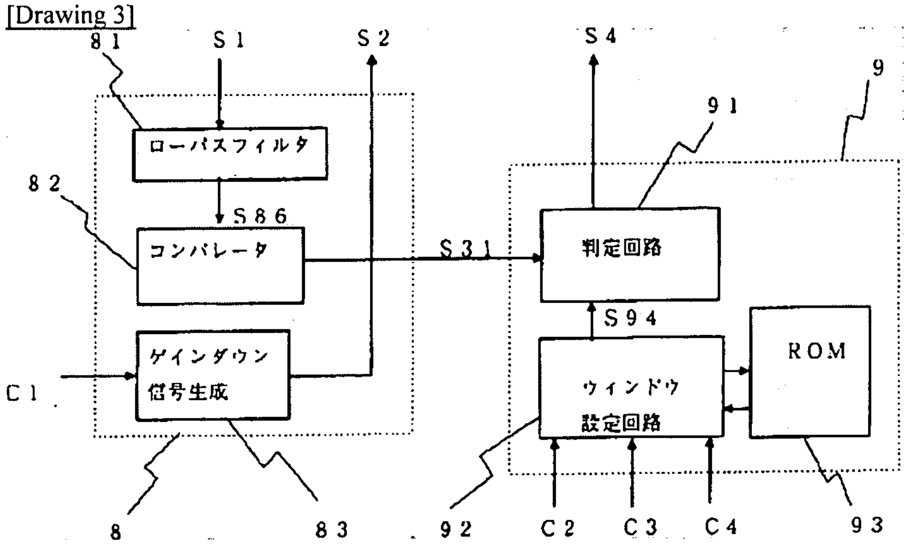
[Translation done.]

DRAWINGS

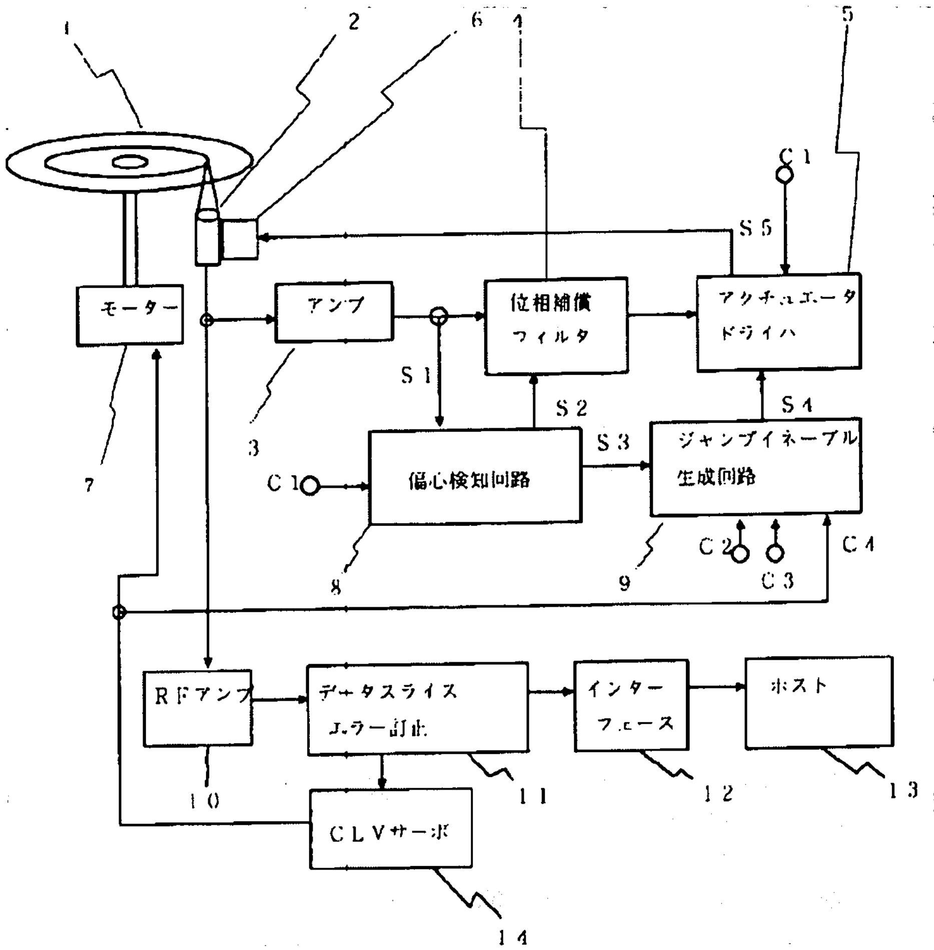
[Drawing 1]



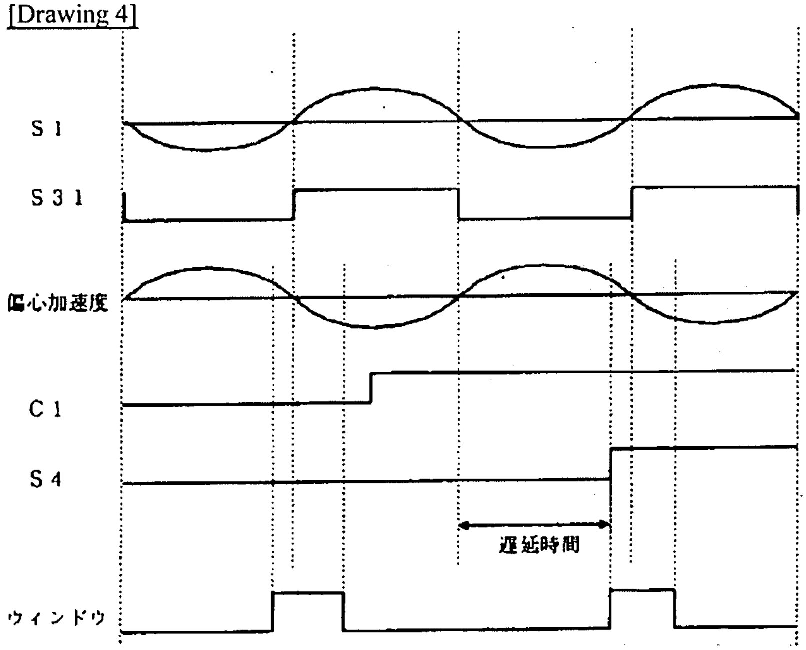
[Drawing 3]



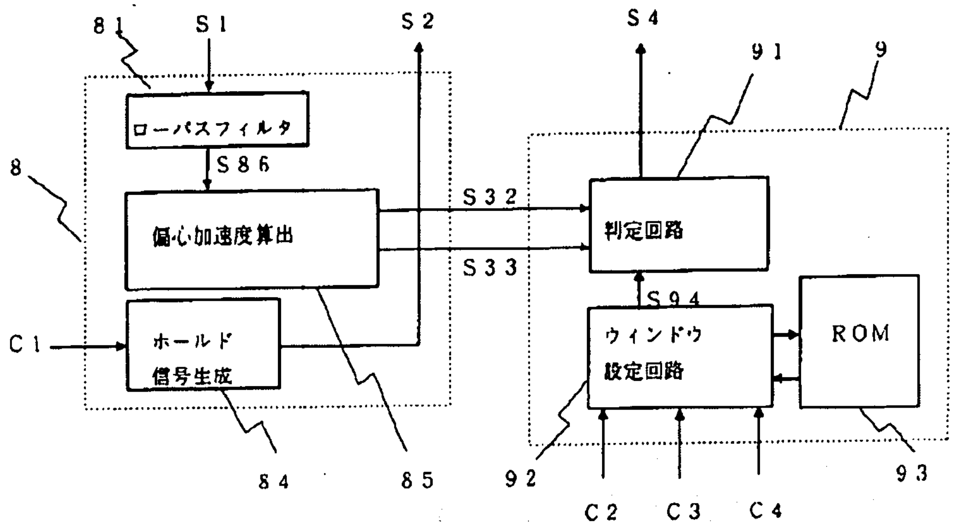
[Drawing 2]



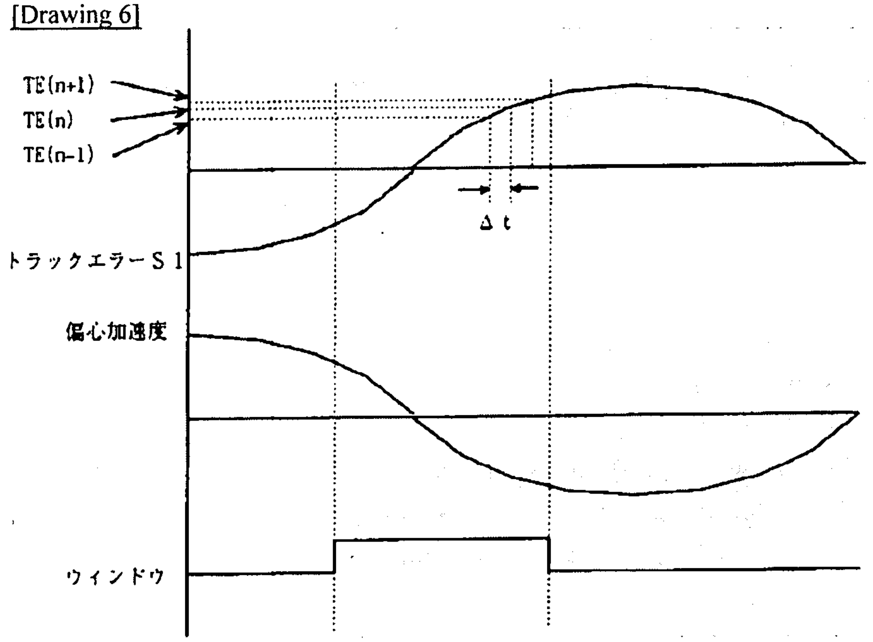
[Drawing 4]



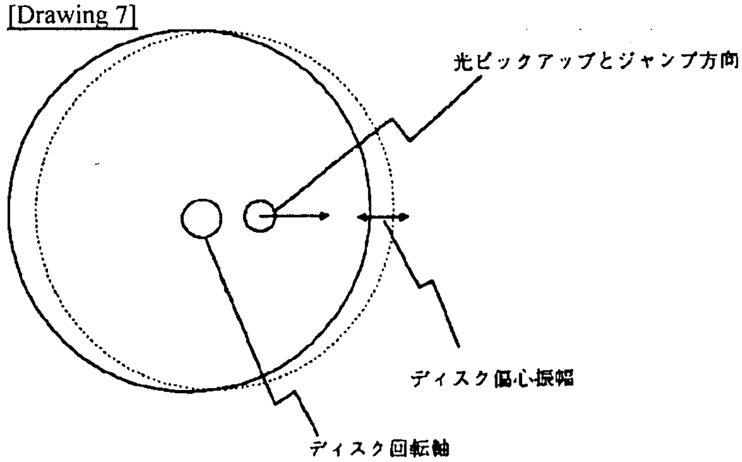
[Drawing 5]



[Drawing 6]



[Drawing 7]



[Translation done.]